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BRIEFLY TOLD.

AN INTERESTING DECISION.—A court case that had many interesting points for gas men, which has been in process of adjustment for quite on to two years, and frequent mention of which in its various stages has been made in the JOURNAL, was decided something over three weeks ago, by the Judicial Committee of the Canadian Privy Council. The points in the final determination, as forwarded by a correspondent in Montreal, are herewith submitted :

"The case, titularly known as the 'Montreal Gas Company versus Cadieux,' was an appeal from a judgment of the Supreme Court of Canada, May 6, 1898, reversing a judgment of the Court of Queen's Bench for Lower Canada (appeal side), and restoring a decree of Mr. Justice Mathieu. The arguments were recently addressed to a Board, composed of Lords Watson, Hobhouse and Macnaghten, and Sirs Fry and Strong, when judgment was reserved. Sir Henry Strong, in delivering their Lordships' judgment, on July 27, said the appellant Company made and supplied gas in Montreal and was incorporated by statute. The respondent was one of its customers. He had two sets of premises in Montreal—viz., 1,125 Notre Dame street (his place of business) and 282 St. Charles Borromeo street, where he resided. He took gas from the Company for both. The question was whether he was entitled to require the Company to supply gas for the one set of premises while he neglected to pay his gas bill for the other. The answer must largely depend upon the statutory powers of the Company. Originally the latter had no special power bearing upon the question ; but in 1849 its powers were extended by a statute of the Province of Canada, so as to enable it to deal with defaulting customers. Section 29 of the Act of 1849, which was evidently borrowed from the Gas Works Clauses Act (1847) of the United Kingdom, was, so far as material, in the following terms : 'If any person * * * supplied with gas by the Company shall neglect to pay any rate, rent or charge due to the Company at any of the times fixed for the payment thereof, it shall be lawful for the Company, on giving 24 hours' previous notice, to stop the gas from entering the premises, service pipes or lamps of any such person by cutting off the said service pipe or pipes, or by such other means as the Company shall think fit.' Then followed a power for the Company to recover the amount due to them at the time, notwithstanding any contract to furnish for 'a longer time,' and also a power, within certain hours of the day, to enter the premises and remove its own property, on giving 24 hours' previous notice to the 'occupier or person in charge.' The respondent was not altogether a desirable customer, in that he was tardy and irregular in his payments. Between February, 1890, and December, 1896, the Company had to send him 15 notices threatening to cut off his supply, before the accounts were paid, and on five occasions it had to cut off the supply for non-payment. On September 19, 1895, the Company was compelled to cut off the gas at No. 1,125 Notre Dame street, for non-payment of the bill for gas supplied to that house, which measure had no effect in producing payment. The Company then gave the respondent notice that unless its bill was paid it would cut off the gas at his residence in St. Charles Borromeo street also ; and at last, after repeated notice to that effect, it carried its threats into execution and cut off

the gas at both houses. Instead of paying what he owed to the Company the respondent brought this action to compel it to continue the supply of gas to his residence. Mr. Justice Mathieu, sitting in the Superior Court, decided in his favor. The Court of Queen's Bench unanimously reversed that decision. The Supreme Court (Mr. Justice Taschereau dissenting) set aside the judgment of the Court of Queen's Bench; but the case appeared to their Lordships of the Privy Council to be too clear for argument. The only question was one of fact. Was the respondent (in the intent of the act) a person supplied with gas by the Company who had neglected to pay a rate, rent or charge due to the Company at the time fixed for the payment thereof? It could not be disputed that he was. The occasion had arisen, therefore, which authorized the Company to stop the gas from entering his service pipes. There was nothing in the act to limit the right of the Company to the service pipes of the defaulter in a particular building or connected with a particular meter in respect of which the default had been committed. There was nothing in the act to throw the rate, rent or charge for gas upon the premises for which the supply was furnished or to make it payable out of the premises of the dafaulter. The supply was to the consumer, and the default was his. His liability to the Company was for the whole of the debt which he owed it at the time. The argument of Mr. Justice Girouard, who delivered the judgment of the Supreme Court, seemed to be this: The power given to the Company of stopping the supp y of gas to a consumer who neglects to pay his gas bill is an exorbitant power. This provision must, therefore, be construed strictly. The only reasonable way of construing it is to limit the power of the particular building in respect of which the default has been committed, according to Girouard, for it was his thought that any other construc- would lead to disastrous consequences. 'If,' said he, 'a corporation, for instance, took a supply of gas for its streets, and also for its public buildings, it would be unreasonable to cut off the supply for the streets because the corporation neglected to pay the bill for its buildings.' The Privy Council, however, failed to see anything unreasonable in the particular instance given, or anything unreasonable in a provision authorizing a gas company to cease supplying a customer who would not pay his bills; but the real answer to the argument of the learned Judge was that it was not for the Court to pronounce an opinion upon the policy of the legislature. Their only duty was to give effect to the language of the legislature, construing it fairly. It seemed impossible to find the limitation in question in the language of the statute without introducing some proviso or some qualifying words, which were not there. On the result, therefore, their Lordships advised that the appeal should be allowed and that the respondent ought to pay the costs in the Courts of Canada. Adieu, Cadieux.

HERE IS SOMETHING DIFFERENT.—In contrast to the above, the fol lowing, which is from the *Evening Post*, New York, August 17th, is presented: "One of the branches of the Standard Gas Company's business is to put slot machines in houses, into which a quarter may be deposited, in return for which a supply of gas for a time may be had. Many of these are in Harlem. One is in a big apartment house at No. 434 East 86th street, at which Chas. Litling is janitor. The Company has been complaining that somebody has been robbing these machines by breaking into the money drawers and stealing the coins. The Company decided to take the meters out, and John Mooney, an inspector of the Company, went to take them out of the house named. Litling met him and would not let him in, so Mooney caused the janitor's arrest. When Litling was arraigned in the Harlem Police Court this morning and the case was explained to Magistrate Crane, he became indignant. 'These gas companies,' he exclaimed, 'are the greatest kind of institutions for taking a man's life. They take the life-blood of a man. They would take the hair off a man's head if they could, and off his family's heads. The man is discharged.'" Is it possible that the "Magistrate" has had any trouble with a gas company on account of the failure of the latter to *give* him gas?

NOTES.—In the reorganization of the Bowling Green (O.) Gas Company the following officers were chosen: Directors, James O. Troup, James G. Hickox, James T. Lynn, F. K. Pelton and Wm. E. Rooney; President, James T. Lynn; Vice-President, James O. Troup; Secretary and Treasurer, F. K. Pelton. The complete piping of Bowling Green is being gone on with.——The reconstruction of the plant at Galion, O., will be completed by October 1st.——Mr. Jas. D. McNulty, Clerk of the Village of Saratoga Springs, N. Y., advertises for bids for the public lighting thereof, for 1, 2, 3 or 4 years, by means of arc and incandescent electric lights, and Welsbach or other form of gas burners. Bids will be received up to 3 P. M. of October 7th.——The Gas Light Company of the City of New Brunswick, N. J., has declared a regular semi-annual dividend of 5 per cent., and an extra dividend of 2 per cent.

[OFFICIAL REPORT—REVISED BY THE SECRETARY—CONTINUED FROM PAGE 252.]

SEVENTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD IN SAN FRANCISCO, CAL., JULY 18 AND 19, 1899.

FIRST DAY, AFTERNOON SESSION.

The President introduced Mr. J. B. Grimwood, of San Francisco, who read the following paper on

THE AUTOMATIC IGNITION OF GAS BY CHEMICAL MEANS.

It so happened that not long ago I became interested in a little device for the automatic ignition of illuminating gas which depended for its action, not upon the usual electric battery, but upon the well-known property of certain metals to absorb gases. The subject is fraught with a charm which has prompted me to bring it to your attention to-day, not with the idea of imparting more knowledge, but simply to lay the facts before you as they have been propounded by the able chemists of the past and present. I have gathered information from various sources, and shall make no more than a general acknowledgment, except in the case of Dr. Killing, of Dusseldorf, Germany, to whom I wish to pay a tribute for his admirable article, published in the *Journal für Gasbeleuchtung und Wasserversorgung*, April 29th, 1899. From it I have drawn freely.

In the early part of the present century, Edmund Davy showed that platinum, reduced by the wet way, rapidly oxidized alcohol to acetic acid. Davy was the first to produce platinum black (a dull black powder, consisting of finely divided metallic platinum), and he then thought it to be a nitrite of platinum. It was later shown by Liebig to be metallic, and was prepared by him by warming a solution of platinum chloride in potash and precipitating the platinum by slowly adding alcohol.

J. W. Döbereiner repeated the experiments made by Davy and, as a result, obtained spongy platinum, which he observed had the power to ignite mixtures of hydrogen and oxygen, or hydrogen and air, even at ordinary temperatures. Berzelius called this the most brilliant discovery of the time, and the experiment was soon verified by the whole world of science.

It was soon shown by others that iridium, rhodium, palladium and osmium also possessed this property. Later experimenters pointed out that it was due to the absorption or condensation of oxygen on the surface of the metal. This has been termed by Graham "occlusion," and it is known to take place to a greater or less extent in all metals at high temperatures. According to Liebig, properly prepared platinum black absorbs or "occludes" as much as 800 times its own volume of oxygen, which then appears to be endowed with a remarkable degree of chemical activity.

Platinum black, or sponge (which is platinum in a less finely divided state than the black), is, therefore, an excellent oxidizing agent, if first exposed to a current of air or oxygen, and is used as such in the laboratory. You are all familiar with the very simple and beautiful method employed in gas analysis for the estimation of hydrogen. To the gas residue is added a measured volume of air, and the mixture passed through a tube containing in this case palladium asbestos, the resulting contraction being due to the oxidation of the hydrogen to water. The experiment was performed at one of our meetings some years ago, which most of you will remember. Döbereiner was the first to suggest platinum black for eudiometric purposes, and in 1836 he described its use for the estimation of hydrogen, adding that it will act upon mixtures of hydrogen and oxygen which cannot be ignited by the electric spark.

In 1888 Max Rosenfeld, an Austrian, invented the first automatic gas lighter. He recognized the fact that the so-called Döbereiner pill, made of platinum black ground into a paste with clay or meerschaum and a little water, and then moulded into suitable shape, would not ignite illuminating gas.

The hydrogen of the gas was oxidized with great energy, and consequent development of heat, sufficient even to cause the pill to glow, yet the gas would not light. Greater heat was required, and it seemed for a time that the problem of lighting gas automatically, at least by chemical means, must be abandoned. At this juncture, however, he recorded a remarkable phenomenon which quickly made him master of the situation. He found that if heated platinum wire were held very carefully just at the outer edge of a stream of illuminating gas, or, in other words, at the boundary between the gas and the surrounding air, it

would become white-hot attaining such a degree of incandescence as to ignite the gas almost instantly; but it must be warm, otherwise no action was apparent.

It was now very simple. He had only to combine the pill of platinum black with the platinum wire and the thing was done. The platinum black would become red-hot, but not hot enough to ignite the gas; the platinum wire would, on the other hand, ignite the gas, but not when cold. Now, by making a pill to which a very fine platinum wire or thin strip of foil was attached, and holding this arrangement on contact with the air and outflowing gas, he found no difficulty in producing a light. This principle is the underlying one in all chemical igniters, though the application is varied.

The principle involved in the action of the platinum black and the platinum wire is precisely the same, the black, however, working at ordinary temperatures, perhaps on account of its infinitely greater surface, being in an extreme state of subdivision, while the denser wire requires, first, to be heated, the action once started continuing with far greater energy than in the case of the black.

The platinum remains unchanged throughout, exercising what is called in chemistry a catalytic property. By this is meant the power possessed by some substances of causing changes in others by their mere presence, without themselves undergoing change. It is now generally believed that these catalytic substances do actually take part in the chemical changes they induce, but are always returned to their original condition.

In order to impress upon your minds more firmly what this action is, allow me to quote some other instances. Pure alcohol, as you know, undergoes no change when exposed to the air. Drop some platinum black into it and rapid oxidation takes place to acetic acid, viz.:

$$C_2H_5OH + (Pt)2O = C_2H_4O_2 + H_2O + Pt.$$

Formic acid may be regarded as a reduction product of carbonic acid. To substantiate this view, add a mere speck of platinum black to the acid and carbon dioxide and water are immediately formed according to the formula:

$$\text{I. } H_2CO_2 + (Pt)O = H_2CO_3 + Pt.$$
$$\text{II. } H_2CO_3 = H_2O + CO_2.$$

It is not possible for the action to be other than oxidation. In both instances the platinum black remains unchanged and would last indefinitely.

The first of these automatic igniters was designed to attach permanently to the burner, if a flat flame; or, in the case of Argands or Welsbachs, to be hung within the upper rim of the chimney in such manner that the gas may impinge upon it when the cock is turned. The exact position is found by trial.

Experimentally, these igniters fulfilled all the requirements, but in practice serious objections arose. In the course of time they were found to deteriorate and eventually to become useless. The luminous flame coated them with carbon, and the intense heat of the Welsbachs fused the black into a more compact mass or slowly vaporized it, which, in either case, resulted in failure. It was obviously necessary to remove the pill from the flame and heat as soon as the gas was lighted, and this was done by attaching the pill to the end of a small lever, so fixed on the burner pillar that, by pulling a cord, it was brought into place and held there until the gas ignited. When released, it dropped back to its original position, at one side and away from the flame. Mechanical devices almost without end can be adapted to this idea of bringing the igniter temporarily into position at will.

One very ingenious arrangement depends upon the warping—if I may so express it—of a spring composed of two differently expanding metals. The pill is normally in position for lighting. When the gas is turned on, it lights and the heat of the flame soon warps the spring, which communicates its motion to a lever and the pill is removed a safe distance, where it is bound to remain so long as the gas is on. Turn the gas off, however, allowing the spring to cool, and the pill comes back to its position above the jet.

The most extensively used form of igniter, and that to my mind best suited for satisfactory service, is provided with a pilot so arranged that it is first lighted by the pill and in turn lights the main burner, whereupon the pilot is automatically extinguished. This idea has taken many forms. I have one on exhibition to-day for Welsbachs which I think represents the automatic igniter in its highest state of perfection. It is on the market, both in Europe and America, and while it seems an extremely delicate little device the makers claim to have sold over 700,000 in nine months in Germany alone. Its essential features are: A pilot below and at one side of the main burner, above which the pill and fine platinum wire are permanently fixed in position; the gas way to the pilot is normally open, that to the burner closed. When the gas is turned on it flows, first, to the pilot and is ignited; this heats a platinum wire, encased in a porcelain tube for greater protection, and by its expansion the tension is partially removed from a spring which then opens the gas way to the main burner; this now lights from the pilot, and, being a larger and hotter flame, causes the nearby platinum wire to expand still further. More tension is thus removed from the spring, which then opens the main gas way wide, at the same time cutting off the gas supply to the pilot. When the cock on the fixture is turned off and the gas put out the platinum wire cools, and in cooling contracts; this reverses the operation, so that when the wire is cold the gas way to the pilot is open again and the main gas way closed. This is all accomplished by turning the cock at the fixtures.

In the event of the gas supply being momentarily interrupted, or the gas going out from any cause whatever, it will immediately light again. Herein lies a great element of safety, which will surely aid in prolonging the lives of fools and would-be suicides.

I think if you will take the trouble to examine this igniter carefully it cannot fail to excite your admiration. It is beautifully conceived and well put together. While it leaves nothing to be desired in its operation, I regret that I have not had it in my possession long enough to test its durability. Those who have used it seem to find no fault, though I believe the platinum wire, under constant tension and subject to frequent expansion and contraction, becomes stretched in the course of time, and must now and then be shortened by means of an adjustment screw provided for that purpose.

Mr. E. C. Jones and Mr. Moss Barrett have devised a burner cock for flat flames to be used with a pill igniter which deserves attention on account of its extreme simplicity. The core of the cock is double bored in such a way as to supply gas to a pilot, on about $\frac{1}{16}$ of a turn. The pilot is lighted in the usual manner by a pill fixed immediately above it. Upon turning the cock farther, gas is admitted to the main burner and ignites from the pilot; but long before the main burner is on full, the pilot way is closed again and the smaller light extinguished. As the pilot and igniter are both below the base of the main flame the bill is not subjected to great heat and will remain intact for an indefinite time. The small flame, when on full, is long enough to reach up from below and meet the escaping gas at the burner. A small retardation spring is so fixed as to offer a slight resistance to the turning of the cock just at the moment when the gas way to the pill is wide open. This gives the pilot time to light before the movement is completed. If the gas is blown out, however, this contrivance will not take things in hand, of its own free will and ignite it. This is obvious.

Effort has been made to dispense with the pill entirely by incorporating the exciting material into the fiber of the mantle. Dr. Killing makes a solution of platinum chloride and thorium nitrate. The meshes of a cotton net are interwoven with fine platinum wire and this is immersed in the solution. After drying and igniting, a net is obtained, consisting of an intimate mixture of thorium oxide and platinum black, interlaced with platinum wire. The Doctor uses thorium oxide as being better able to withstand the heat than any other mineral substance.

In the Rutzke self-lighting mantle, which I will show you, this net is sewn into the head before igniting. In addition to this there is a strip of iridium on each side of the mantle running from top to bottom. When the gas is turned on the head of the mantle is seen to glow first, then a line of incandescence runs down the iridium strip and ignition follows.

Dr. Angelo Simonini makes an automatically lighting mantle as follows: He constructs a double mantle, the inner one consisting of about 60 per cent. of platinum black and 40 per cent. thorium or cerium oxide, while the outer one contains about 92 per cent. thorium, 4 per cent. cerium and 4 per cent. didymium oxide, which he found to be highly catalytic when warmed. This secondary mantle was a substitute for and played the intermediary role of the platinum wire in the other forms. Unfortunately, I have none of these at hand.

The question very naturally presents itself, "Will these platinum black pills, or other forms of self lighters depending upon the same fundamental principle, work equally well on different sorts of illuminating gas?" This must be answered in the negative. On some oil gas, and, in general, gases containing small percentages of free hydrogen, they cannot be used. I have tried repeatedly to light Pintsch gas, and also a gas made by a local Company which contained from 10 to 12 per cent. of hydrogen. In both cases I failed signally. The pill would become hot, and, by careful manipulation, the wire might even acquire a moderate incandescence, but the gas could not be induced to light.

This leads me to say a few words before concluding in regard to the

effect upon the pill of other constituents of illuminating gas. Ammonia and sulphureted hydrogen influenced its action very seriously. Upon exposure to either of these gases, it rapidly loses its power, which it re gains, however, if allowed to remain in the fresh air for some time. Sulphureted hydrogen destroys it more rapidly than ammonia. In practice this need not be considered a drawback, as neither of these gases would ever be allowed to reach the burner in any well regulated gas works. Carbonic acid is harmless. Hydrocarbon vapors would have a tendency to condense upon and form a coating over it, thereby hindering its action. It need hardly be mentioned that any accumulation of dust and foreign matter on the pill is inimical to the proper performance of its functions. This alone renders it unreliable for street lights. Herr Drehschmidt, gas chemist in Berlin, set up two in the open air, one of which failed to work in a very short time, while the other was as active as ever after a period of several weeks. He argued that it could not be laid to the moisture of the atmosphere, else both would have failed, as the conditions were identical.

There is one more point to be noted. Burners supplied with these lights cannot be placed far from the cock, for if this were done it is plain that the whole length of intervening pipe must be flushed out each time the burner is lighted. This would require a long time, and is not practicable.

Discussion.

The President—This paper is of more than passing interest. Mr. Grimwood is ready to answer any questions.

Mr. Gutsch—What are the components of these igniters?

Mr. Grimwood—Platinium and palladium are generally used. To bring about the primary action which takes place at ordinary tempera tures platinum or palladium black is used.

Mr. Gutsch—To make the igniter a commercial success I should think it would be to expensive. Is it not possible that they would have to be renewed every three or four weeks?

Mr. Grimwood—No; I think they would not need to be renewed as often as that. For out-of-door lighting they have not been a great success, but indoors the igniters have been tried in various places, and it has been found that they will work satisfactorily, even if lighted a number of times a day, day in and day out, for months and months. Providing they do not come into contact with such gases as ammonia and sulphureted hydrogen there is no reason why they should not last indefinitely. In regard to expense, the little pill costs only a mark, a matter of 25 cents.

Mr. Gutsch—What do you consider the special points of value in this igniter in comparison with ignition by electricity.

Mr. Grimwood—The value lies largely in this. Suppose you want to fit a house up with automatic igniters and there are no wires. In order to use electrical ignition, the house would have to be wired, and the first cost thereof would be considerable. Another thing to be con sidered in connection with electrical ignition is that when one burner fails, 9 times out of 10 every burner in the house fails, the trouble being due to some defect in the wiring or weak batteries. With the igniters that I have shown, should one burner fail the others of course would not be affected.

Mr. Gutsch—Do you think that these igniters are ever likely to be used universally in place of electrical igniters? Do you think that they have a future before them?

Mr. Grimwood—They will not be used universally in place of elec trical igniters. Yet I think they have a future. I must confess they are not quite as quick as electricity. They are handicapped, of course, in some respects. In lighting a large room or hall in which the burners are far out of reach, it could not be done from one cock, whereas with an electrical igniter all that it is necessary is to press a button. If the gas cock is in one corner of the room and you turn the cock on there, all the pipes on the fixture side of the cock must be filled with air. Now all that air would have to be flushed out through the tiny by-pass. It might take several hours to do it.

Mr. Jones—Could not that be obviated by double piping?

Mr. Grimwood—Yes, it might be done in that way, but would increase the expense and probably off-set the saving over wiring.

Mr. Gutsch—In reference to my first question concerning the ingredients, platinum, etc. You say it will not deteriorate as far as you know, and that you might be able to use the same igniter for years. I understand then that we practically have an igniter which would cost but one-fourth of what the present method does with the only disadvantage of not being able to light lights at a distance from the main cock.

Mr. Grimwood—They cannot be used to advantage out of doors, as I have said before; nor can they be used with all gases. I tried it on Pintsch gas and found I could bring the pill to a red heat, and occasionally, by very careful adjustment, I could make the platinum wire become incandescent, but it did not reach as high an incandesence as it does with coal gas or any ordinary illuminating gas, and it apparently was not sufficient to cause the gas to ignite. I did not succeed in a single instance.

Mr. Jones—Is it possible with this new form of igniter that has a future before it, to light what is known as the "Hall" gas.

Mr. Grimwood—I have not succeeded in lighting it. That gas contains from 10 to 12 per cent. of free hydrogen, but acts in the same manner as the Pintsch gas although the Pintsch gas contains from 2½ to 3 times the illuminants. Pintsch gas contains 12 per cent. of hydrogen, perhaps, and 23 per cent. of illuminants, but it would not ignite. I would heat the platinum wire red sometimes, but I could not induce it to light. The gas referred to, made by local company, acts about in the same manner. It contains about 10 or 12 per cent. of free hydrogen, and the illuminants run from 7 to 9 per cent The failure of the Pintsch gas to light may have been due to the presence of impurities. Unfortunately, at the time and place where I tried it I could not test for them.

Mr. Lowe—Does the value of this lighter depend upon the amount of hydrogen contained in the gas?

Mr. Grimwood—It appears to depend to a considerable extent upon the amount of hydrogen, yet it does not depend upon that entirely, because it is affected by acetylene gas which has no free hydrogen.

Mr. Lowe—Will it light it?

Mr. Grimwood—I have not been able to effect ignition. I think that with a gas rich in hydrocarbons, if they are decomposed by the action of oxygen, the carbon would in all probability be deposited as free carbon. In that case the free carbon would so cover the pill as to render it inoperative, exactly in the same manner as the sulphur in our purifying boxes is deposited as free sulphur and finally covers the oxide so that it becomes spent. It is simply due to the amount of free sulphur contained in the oxide of iron. I think that is the same kind of action that goes on in the pill.

Mr. Lowe—Do you remember the percentage of hydrogen in the Hall gas?

Mr. Grimwood—About 10 or 12 per cent., I think. In the "Equitable" (or Hall) the illuminants average 7 or 8 per cent. I have known them to go down to 6 and up to 9¼.

Mr. Lowe—It would seem then that the hydrogen alone does not play the important part.

Mr. Grimwood—The free hydrogen does not play the *only* part.

Mr. Lowe—Not an absolutely vital part, it seems to me, under the circumstances, when a gas containing 10 or 12 per cent. of hydrogen will not excite this igniter and another containing about 6 per cent. may.

Mr. Grimwood—Exactly, providing there are sufficient hydrocarbons present. If you take two gases absolutely free from illuminants, then the gas containing the higher percentage of free hydrogen would act upon it.

Mr. Lowe—Has it occurred to you to make experiments with hydrogen mixed with air?

Mr. Grimwood—I have experimented with pure hydrogen, showing that its action is rapid. You cannot bring the pill anywhere near the escaping gas without causing ignition. It acts with a marked rapidity. That would go to show that the hydrogen is the active element in the gas.

Mr. Eichbaum—You are not old enough to have seen the cigar lighters in use in 1812. I have seen them as far back as that, made on the same principle. The apparatus consisted of a small vessel containing sulphuric acid and zinc, a small cock with a spring, and a piece of platinum. By pressing the cock it was so arranged that hydrogen was projected against the platinum and immediately heat enough was generated to light the cigar.

Mr. Grimwood—I have already stated the principle has been known since 1823.

Mr. Guldlin—In regard to the cigar lighter, I remember having seen one in Norway in 1875.

Mr. Clements—I want to say a word in reference to this matter. The idea, it seems to me, is to have a good quality of gas. A good article of any kind is always on the market. Now there are some gases that cannot be ignited in any application you may make of them. A gentleman made an exhibition test of a certain gas made here in San Francisco. He undertook to light it with a wax taper 16 feet long. The entire taper was burned, and his hand was scorched, but the gas was not lighted.

Mr. Grimwood—I think you have it in a nut shell.

Mr. Clements—Do you know the price of this lighter, and who controls it?

Mr. Grimwood—I believe the Welsbach Company has acquired the patent for the United States. Is that not so, Mr. Ewing?

Mr. Ewing—Yes. I have a letter from the General Manager, saying that he will put it on the market about the 1st of August. The price has not yet been determined upon.

Mr. Jones—Did I understand you to say that you could not ignite Pintsch gas with it?

Mr. Grimwood—Yes; but I have succeeded in igniting the Baldwin gas.

Mr. Jones—The Baldwin gas contains 2 per cent. of hydrogen and the Pintsch gas 12 per cent. The Hall gas, as made at Buffalo, New York, contained 13 per cent. of hydrogen.

Mr. Grimwood—The percentage in the Hall gas here is generally somewhat less than that.

Mr. Jones—How do you account for that difference?

Mr. Grimwood—I think it shows that the action is not entirely due to the free hydrogen, although I still maintain that it is principally due to it. In cases where the free hydrogen is insufficient the quantity of illuminants affects the action, due, I think, in all probability to the decomposition of the hydrocarbons.

Mr. Collins—Regarding the durability of the burner controlled by the Welsbach Company. I have one in use, and have given it a trial equivalent to about three months' of ordinary commercial use. It is still working quite satisfactorily.

Mr. Grimwood—Have you found it necessary to make any adjustment?

Mr. Collins—I adjusted it when I received it; not since. Have you noticed the fact that after it has been used for a time it will not work?

Mr. Grimwood—It will light finally, but it is very slow. For a few moments after it is turned off, the gas way is open to the main burner so that the gas does not come in contact with the pill, but after it has cooled the main gas way is closed and then it ignites.

Mr. Collins—About the question of hall lighting. Is it not quite possible to have a return pipe so that you could flush your line to the jet, if necessary?

Mr. Grimwood—I think that could be done. No doubt contrivances could be arranged. One other objection to this burner has occurred to me. We have used the Wilder governors on our street lamps and found that, after a time, a sort of gummy substance forms on the disk inside of the governor, causing it to stick, so that in the course of a few months they have to be taken off and brought into the shop. They are there taken apart and cleaned, and we find the trouble to be due to a deposit of the gummy substance I have mentioned. Now there is a little valve in this burner that controls the main gas way which would be open to that same objection. Tarry matter might be deposited there, and, being a delicate instrument, it might interfere with its proper action.

At the close of the discussion a vote of thanks was passed to Mr. Grimwood for his paper.

The President then called upon Mr. F. H. Eichbaum, of San Francisco, Cal., to read his second edition of

REMINISCENCES.

Mr. Eichbaum in introducing his paper said it was the continuation of one read by him two years ago, but it had grown to such a length at that time that it was not expedient to bring it down to the present day. The Secretary objected to it as being rather short, but the reason for that was that if it were longer it would serve as a kind of advertisement to various sorts of apparatus, so he thought it was best to let it stand as it was. Continuing the author read:

In 1865, when the boys in blue and gray had returned to their homes and avocations of peace, it was loudly proclaimed that cotton was no longer king, and that thenceforth petroleum was the desideratum which should take the place of dethroned cotton. As usual, the wish was father to the thought, as it was well known that the petroleum discoveries had for the most part been made in the State of Pennsylvania, but there was in the Southwestern States a number of localities in which greasy creeks and greasy coves were found, and had been so named in consequence of small natural seeps or springs betokening the presence of oil.

A large territory situated in West Virginia, Kentucky and Tennessee, was at that time thought to be rich in oil supplies. Some of this territory has been exploited with great results and much that is known to be good territory is still held as a source of supply in the future. For some years the only use for the oil was to be refined into kerosene or coal oil, but the supply outran the demand to such an extent that the price dropped, from $6.50 in 1865 to $2.41 in 1867. It was soon discovered that gas could be made from petroleum, although the gas men of that day did not make any special effort to utilize it, and it for the most part fell to the lot of men who were not in the regular line of gas business to experiment with the new gasmaking material. The refining of the crude petroleum produced the light, volatile naphtha, known from the commencement almost as gasoline. To use this as a means of producing artificial light was a very simple matter, and hosts of machines (automatic, union, pneumatic, etc.) sprang into use and were made the basis of innumerable companies, some of which survive to the present day, and, while filling a useful purpose in suburban localities and villages, vexed many a poor honest gas maker by taking from him his most valued customers and, in rare cases, do so even yet.

The numerous accidents, explosions and disastrous fires resulting from incautious handling of a substance which is in many respects more dangerous than gunpowder, because the latter can only be ignited by taking fire to it, whereas gasoline fumes will travel 40 or 50 feet to a light, as was soon found out when gas machines were set in kitchens, cellars, or any place where there was convenient room, and the attitude of insurance companies towards these family machines, finally forced them out of use to a great extent, and much safer machines, located at a proper distance, came into use and still hold a certain field in domestic illumination.

Many ingenious schemes were resorted to to utilize air gas as an illuminant on a rather extended scale, two of which are worthy to be mentioned. In a Western town doing a good business with coal gas, there was installed an apparatus constructed as follows: Two boiler iron tanks, of a capacity of 10 barrels each, were placed in wooden tanks filled with water, and firmly anchored therein; these boiler iron tanks, which were perfectly tight, being two-thirds filled with 87° gasoline, were connected by pipes to an air pump driven by a small steam engine, and air was forced through one or both tanks as desired through pipes which were open at the bottom of the gasoline tanks, and the outlet of these vessels was connected to the inlet of the holder which supplied the town. The mixture was intended to be about 25 per cent. of the gas made and delivered; it was made between 10 and 4 o'clock. The light was brilliant but flabby, and exposed lights were easily blown out. How long the apparatus was used I cannot state, as my experience of it was of 10 days' duration only. This was the most extended use of air gas that ever came under my observation.

A very ingenious machine was used extensively in New York, and some other cities, called a gas saving meter, although there was no meter connected with it. A carbureter of two or three chambers supplied with gasoline of 87° to 90° gravity, and fed by the old bird fountain device, was placed in connection with the meter supplying the gas from the city mains in such a manner that, by means of a wet meter drum containing two compartments, a mixture of city gas and air gas in any desired proportions was delivered according to the proportions for which the drums were constructed. A great number of these machines were put into operation for hotels and large gas consumers. They were not, as a rule, sold, but were attended to and kept charged by the employees of the company, which did quite a profitable business. Eventually, the objections of the insurance companies and the dangers attending the handling of the gasoline, forced them out of existence, and to my knowledge none survive.

There was a host of patentees of different forms of apparatus more or less resembling the Pintsch apparatus. Wrenn, of Brooklyn, N. Y., J. Desha Patton, and others, worked hard to induce gas companies to manufacture pure oil gas, and use it in burners which gave a small but brilliant light, the burners consuming from ¾ to 1¼ feet per hour. The gas was claimed to be, and probably was 80 to 100-candle power, and to be equal to five times the amount of ordinary coal gas; that is to say, 1,000 feet of the pure oil gas was equal to 5,000 feet of coal gas, and it is a fact that many companies who at that time (1870 to 1875) made and furnished pure oil gas used meters so constructed as to register on this assumed basis. Of these companies, on this plan, none survive to my knowledge at this time.

There was at this time a works running under the patent owned, I believe, by the National Coal Gas Company, at Poughkeepsie, N. Y., which, had it not been for the plan of heating by the ordinary bench system used, might have forestalled the Lowe process, which came into use about the year of 1876, or, perhaps more strictly speaking, 1875. This process of making gas, which possesses extraordinary merit and deserves credit for extreme ingenuity, was founded on the ordinary bench system with the ordinary clay retorts, differing only in this that the retorts had a double bottom. The coal was charged into these

retorts, and when the volatile substances had been driven off, leaving behind the coke, steam was admitted under the coke resting on the false bottom, which was perforated at the end farthest from the front, and water gas was thus made, which was enriched by the use of petroleum gas made at the same time in a bench used for this purpose. This process, although claimed to be a great success, did not spread to any extent, in spite of the fact that the experts who examined the process and the product had nothing but praise to bestow upon it.

About the same time a system of making gas from wood in long retorts, in which the gas was caused to pass through 8 or 9 feet of the charcoal produced from the previous charges, and was mixed with oil gas made from naphtha in separate retorts, came into use to some extent, notably by the Mutual Gas Light Company, of New York. The economical use of the wood gas which passed from the wood gas retorts into the retorts in which the oil gas was made, by means of an interior pipe communicating with the inlet to the oil gas retorts, and thus shielded the oil gas from destructive decomposition, was a great feature of this process, and the amount of carbonic acid which had been the bane of previous wood gas processes was reduced to a very small and insignificant quantity. Many thousand million feet of this gas were made at various points, more by far in New York city than all others combined. One defect that it had was that the charcoal produced was utterly worthless and people would not even steal it. It was used as fuel to get rid of it, but had no value; the draught carried the ashes up the stack, and that was the end of it.

The Rand & Gale process also was in vogue at the time, and the rights to use this process were bought extensively by the larger gas companies, some to use the process and others for the sake of being protected from the extremely active and accomplished promoters.

The process, described as briefly as possible, consisted in vaporizing petroleum of 36° to 40° in a still, with superheated steam and fire, if needed; the vapors so produced were carried in pipes to the inlets of retorts of the ordinary construction, having interior retorts which carried the vapors to the back end of the retort, which were heated in the ordinary manner. The gas produced by this means, which was called 80 to 100 candle power, was drawn through the retorts by means of exhausters which mixed the oil gas with about 40 per cent. of air, and this mixture was a fair 18 to 20 candle power gas. As this gas was in every case, to my knowledge, mixed with a certain amount of coal gas which was made in order to make coke to heat the oil gas fixing-benches, the gas was mostly free from the defects common to mixtures of air and oil gas. When there was no mixture of coal gas with the Rand & Gale gas this defect was noticeable and troublesome. Although from a description of this process it would seem as if to merely convert petroleum vapors into a fixed gas would be an easy matter and free from all contingencies, yet the troublesome and perverse habit that oil gas has of decomposing when subjected to high heat and depositing tar and free carbon, gave a great deal of trouble, and it was a common occurrence to have to shut down and every man mount a standpipe to punch out the deposited carbon. Of course, the heats being too high or the supply of vapors too great for the capacity of the retort was the cause of the trouble, which, however, was not, and is not now, peculiar to this process, which had a great run for some years, and at that time was the only process suitable for the utilization of oil in large works. The oxyhydrogen process of gas making was brought before the public about the same time as the Rand & Gale. Under this process gas was made on a large scale in Buffalo, under the skillful management of the present Chief Engineer of the Consolidated Gas Company of New York. In this process oxygen gas was manufactured and stored in a separate gasholder and was conducted in a pipe to the burners supplied with good coal gas. The process of manufacturing the oxygen was ingenious and economical, but expensive, and although the light was brilliant beyond anything at that time produced the venture was abandoned and the works changed to the regular coal gas. There was a small plant erected near the Fifth Avenue Hotel, in New York, and there was generally a crowd around there to admire the light, which was exhibited for quite a long time.

About the same time the plant of the Municipal Company was built and put into operation in New York City. In many respects this plant and process possessed decided novelties and excellencies, as shown by the number of imitations which have been brought before the public and exist up to this time in perfect harmony, and have never, to my knowledge, wasted either time or money in sueing each other for infringement of their respective patents, but have devoted their energies to the more profitable business of making and selling good gas, which, by its high candle power, has done much to raise the standard of gas used in New York and adjacent cities.

Briefly, the process of manufacture at the Municipal gas works was as follows: Blue gas was made in cupolas, and stored in a holder to be drawn out as needed; the blue gas was carried in pipes to carbureters containing naphtha of high grade heated by steam pipes; the blue gas carrying with it the vaporized naphtha was conducted to fixing benches of the ordinary construction, and then sent to storage holders after being put through the usual stages of condensing and purification. This process and method of manufacture, owing to the extremely low price of naphtha, the production of which had outrun the uses which had been found for it, must have been extremely profitable. Witness the extension of the works and the hosts of similar projects started about shortly afterwards, none of which to my remembrance failed to do well, and indeed at this date quite a large percentage of the gas made in and near the city of New York is manufactured under processes which vary but in a small degree from the original Municipal gas process and apparatus.

In 1876, while attending the great exhibition in Philadelphia, I went to Manayunk, a thriving suburb of Philadelphia, to see the Lowe process, which had been installed in the Manayunk gas works, at that time and now a branch of the gas works owned by the city of Philadelphia. The works were well planned and built in a substantial manner, and were run, as far as I know, continuously, for I visited them several times and found them running each time.

The style was of the gooseneck type used in the early Lowe works, and the operation of gas making was as described in the original patent papers, although alternatives were described and suggested in the same papers. I understood at that time that the steam was superheated by passing it down through the superheater, but by what means it was admitted to the base of the generator, decomposed and brought in contact with the oil, I was not informed, and I could not say with any certainty that this was the procedure in use, as coal gas people were not exactly popular with the parties in charge at the time of my visits. However, when the Lowe process was installed in San Jose the oil was showered on top of the incandescent fuel, there vaporized and carried by the blue gas generated in the fuel bed by the steam passing upward, and the mingled blue gas and vaporized oil were carried by the gooseneck pipe to the base of the superheater and up through the heated superheater brick to the outlet. The apparatus at Manayunk impressed me very favorably, although the tar seemed to give a great deal of trouble. It did not seem to attract much attention from gas men at that time, and seemed to be considered one of the "novelties" which disturb our peace, and was as a rule, to my remembrance, looked upon with disfavor by the profession. As you all know, it soon began to assert itself, and has been a great success, and will be as long as petroleum continues to come from the ground. Imitators, improvements and infringers multiplied without end; most prominent among the second class was the so-called Springer form of apparatus on which patents were based. To my knowledge, several of the Springer style were built, and in use without any knowledge of the Springer patent having been asked for or obtained, notably two in San Francisco.

Having brought these reminiscences down to the present time—or nearly so—I conclude them with the recommendation to all who wish to thoroughly understand the whole subject of the Lowe process and the various forms of the same and improvements upon it, to procure a work published by the United Gas Improvement Company entitled "Water Gas in the United States," by Alex. C. Humphreys, M.E.

Discussion.

Mr. Eichbaum—Having read my paper, I would like to say that there is not to my knowledge any history of water gas in existence—that is to say, taking it up fully as a subject by itself. I should think that some young man who wanted, not exactly to immortalize himself, but certainly to confer a great boon upon the gas-making profession, would find it a great thing to take up the subject of water gas and oil gas together, and write a full and complete history thereof. In relation to coal gas we have "King's Treatise," but it barely mentions oil gas, and to my knowledge there is no work that takes the place of "King's Treatise" for coal gas. I merely throw this out as a hint. I think it would be well worth anyone's while to write such a history, but they would have to go a great deal further back than the Lowe process.

Mr. Jones—A year ago I was hit pretty hard by one of our Eastern journals for telling one of our dear friends that in order to run a water gas plant successfully on the Pacific Coast, he must become perfectly familiar with Pacific Coast conditions, fuel, etc.; and as our Past-President, Mr. Eichbaum, has written this paper, I would like to ask him if his own experience has not proven this to be true.

Mr. Eichbaum—I would say that I consider it absolutely essential

to any person who has been making gas in the East to become familiar with the oils and fuels used on this Coast. I do not know that it is necessary to give any reasons therefor; but that is my experience. I was talking to Mr. A. S. Cooper concerning the essential difference between the oils of this Coast and the oils on the Eastern side of the continent, and he agrees with me that there is a very great essential difference between them, and results cannot be obtained from oils here that can be obtained from oils on the Eastern coast. As to fuel, I might give my experience with Welsh anthracite. I do not know that I have ever told it here before; but if I have I may be excused. In 1884 I took charge of the Central Gas Works, then owned by Charles McLaughlin. I found in the corner of the gas house about 100 tons of Welsh anthracite coal, and of course I asked them about it. They said it was no good; if used it would either burn the bars out immediately or melt them into pig iron in the bottom of the generator. I thought, however, that it was worth while to try the coal. At that time we were under the necessity of taking the fire entirely out of our generators once every twenty-four hours. It was a work of two hours, and sometimes more to knock the clinkers out, which, in a generator 36 inches in diameter on the inside, narrowed it down to an aperture of sometimes 16 or 18 inches. Of course they had to be bored out and it was a very tedious job. I thought I would experiment with the Welsh coal, and put about 6 or 8 inches of clinkers on top of the bars to prevent melting. To my astonishment we ran for a week or more and never had to take the coal out at all. I was told, too, that the coal had been productive of serious danger in tug boats. Some that had used it had melted their bars away, were compelled to signal for assistance and be towed back. I do not know whether or not any of you heard of it, but the same thing happened in several cases. Finding out that it did not have the defect the Lehigh coals had of clinkering and stopping up the generator, I bought 800 tons of it without the permission of the U. G. I. Company, who were much vexed about it, but on examination found it was the right coal to use. Mr. Howard has told you of the enormous quantities that have been brought here since that time. Perhaps if I had not made that experiment, it would not have come, unless someone else had tried the same thing In this connection, I would state that Mr. Bradley, the Chief Engineer of the New York Consolidated Gas Company, wrote to me about the same difficulty several years ago, and I referred him to the Welsh anthracite colleries and told him where the coal could be obtained. They had the same trouble with clinkering that we had here. I do not think the difficulty would have occurred to the same extent if it had not been for the small diameter of the generators. With a larger generator the clinkers would not have come together. At that time a 6-foot generator was as large as has been made. That is the history of the bringing of Welsh anthracite coal here, and I am sorry to say that even at the present time the Pacific Coast has to pay duty on that coal owing to the manipulation of our Eastern friends.

Mr. C. F. Adams—Why is it we do not have this trouble now?

Mr. Eichbaum—We don't have that trouble now because we never clean our bars thoroughly. In starting up a clean fire we always blow a while and steam a while; otherwise we would melt these bars every time. The Welsh anthracite will burn right down to the bars, while the Lehigh will not.

The President appointed Messrs. Taylor, Petch and Gutsch, a committe to nominate four directors for the ensuing year.

The Association then adjourned, to reassemble at 10 A.M. of the 19th inst.

SECOND DAY, MORNING SESSION.

The meeting was called to order by President Adams at 10:25 A. M.

The President called on Mr. John Clements, of Red Bluff, Cal., to read his collection of

EXPERIENCES

for the year, which the compiler did as follows:

Fellow Members of the Pacific Coast Gas Association: Once more we meet in annual session, to relate some of our experiences of the past year. To most of us it has been an eventful one, especially so in most of the small interior towns embraced in our territory. But I find it the same this year as I have found it in the past; while many have had experiences galore, but few seem disposed to furnish them in form for publication. Many will relate their experiences on the floor of the hall where and while the Association is in session, but they do not seem to be able to afford the time to submit their experiences in writing.

The most important thing I have to note is that many of the smaller companies are changing their processes from coal to oil and water gas, and as there are so many methods of manufacture and so many styles of apparatus, most of which have only been in use a short time, it is a task indeed to get sufficient data from any to give anything like an experience on this line.

I am fully convinced, however, that the inland gas companies along the line of the railroads, at any great distance from San Francisco, can do no better than to adopt some of the oil and water gas methods of manufacture.

I am also convinced that the gas stove business should be put to the front and worked for all that is possible. By this means the output of most works can be kept at a uniform condition from January to December. The experience of gas managers is so varied in the conduct of this branch of business that again I am unable to say what sort of a policy should be pursued. All sorts of plans are resorted to. Some companies place stoves in people's houses at cost, some on the installment plan (as to payments), some loan stoves. Where competition is strong with the electric people they even have to go so far as to pipe the houses, as the electric people wire them, free of cost. Such experiences as these are hard indeed; nevertheless, this is the only chance the gas people have in smaller towns, and to some extent no doubt in the larger ones.

The other experience that I find to be most general, and which aids the gas companies most successfully, is the use of the mantle lamps, such as the Welsbach; and while I do not want to seem partial to anyone, I must say so far as my own experience goes, the Welsbach is the most reliable. I know that many managers, who have gas only, and who have to fight the current light, would have given up in utter despair had it not been for the mantle lamp.

How this may be with the gentlemen in the cities where large outputs are the rule I am not prepared to say; but those of you who live in the small towns and have to deal with every customer as if he were a member of your family, I conclude that they are your salvation, at least for the present, and until something else that is better may be born into the gas consuming world. That that something else will come there is no doubt, for this age is not a snail treading one; it is up and doing; it is ever active, ever alert, and the gas portion of it is quite as active as any other part of the great system of public utilities. At this day and hour the lighting companies that do not *realize*, that do not *awake* to the situation, will soon find themselves and their investment in the dark, and, like the candle of our grandfathers, be classed as the light of other days.

While this may be true where gas consumers do not keep pace with the times, yet gas will never be a thing of the past. It will press onward and upward, it will have a field of its own, and while the current light will have its place gas will still be as active. Have you as managers and owners of gas concerns given this subject proper thought? Have you gone to the man who requires power and talked with him about using gas for that purpose? Have you told him that, like water, gas is always on tap? Have you said to him that your circuit is ready for use at any time? *If you have not*, when you go to your respective homes, do this. Many of you know that in small towns you cannot afford to run electric plants for 24 hours, but you can furnish gas, and in the furnishing of it you can furnish something that is reliable.

But, fellow members of this Association, I am afraid you will think I have left the field of experience and gone into the business of giving advice. Well, if you do, you will finally have to admit that all this is offered to you *because* it is the result of experience.

When this department of our work was first suggested, the intention was to acquire from the members *working data* and to then compile them in such form as to be a guide and benefit to one and all of the gas companies embraced in this Association. Names of companies or their location were not to be and have not been given. That the companies have not given me more information is no doubt due to the fact that many have not found time, others have not kept strict accounts in special lines, and others may consider them, as it were, state secrets. Yet, withal, I hope you have at least found some pleasure, some benefit from this branch of your work. If you have, I assure you that your humble servant has been amply paid for what little time he may have spent in your behalf. In conclusion, I desire to say that I have not been able to give the work intrusted to me the attention it deserves, on account of the many duties devolving upon me in the past year. I have had my experiences in dealing with the public at large, with the managing board of our town, and all such things incidental to the conduct of the gas business. What I have experienced has been infinitesimal indeed, compared to some of you; but they all have to be met, and all have to be disposed of. The average gas man or gas company is ever looked upon with some degree of suspicion. This no doubt is true in other business, but as a rule the gas man comes forth from the fray with new light, brighter light, better light, and lots of Experience!

No discussion followed the recital of Editor Clements' "Experiences," and the Secretary read the following paper, by Mr. L. P. St. Clair, of Bakersfield, Cal., on

A HISTORY OF A GAS PLANT.

I arrived in Bakersfield, some time in October, 1887. After trying my hand at other business for a few months, and not making a great success of it, I at last found myself free from business cares, in the fall of 1888. Just at this time a "promoter" named Elmore came along and, after looking the place over, informed me that the town needed a gas works more than anything else, and that he was the proper person to supply same. Finally, he talked me into applying for a franchise. The next thing to do was to decide on the best kind of works to install. At the time coal was so high-priced that it seemed almost prohibitory for a coal gas plant, so we looked around for some plan to make gas cheaper. We heard that at Dixon, Solano county, they were making gas by retorting naphtha, so we went up there to examine the plant. We found a very crude apparatus for making gas, but the man in charge declared it to be a success. From Dixon we went to Martinez, where there was also a naphtha plant. Here we found a much better plant, and the man in charge stated that, after it had received a few improvements, which he could easily make, it would be a first-class plant. The result of this last interview was that I made a bargain with him to put in a naphtha plant for us at Bakersfield. In the course of time the plant was installed, and after considerable trouble the gas was finally turned on to the customers. The expert stayed a few days longer to teach me how to make gas with his machine and then left me to my own resources.

There was not much trouble in managing the machine when everything was running smoothly, but when the machine started in to "buck" it was * * * simply awful. I had two or three explosions that made me think my time had come. On warm days I could make gas reasonably well, but on cold days I would sometimes use $6 worth of naphtha in making 1,000 feet of gas; but when summer came my troubles multiplied. I could not make gas poor enough but that it would smoke. Finally I went to a blacksmith shop and borrowed an old bellows that had been thrown away because it was full of holes. This I hung on the outside of the gas house, ran a 2-inch pipe from it through the house and connected it with the outlet from the machine, put in a stopcock to shut the gas back when we stopped blowing. We then loaded the bellows with about 300 pounds of old iron to give it a strong blast. After this, when I went to make gas I took my son (a boy about 16 years old), with me, and we would start up the bellows first and pump up a sheet, or a sheet and-a-half, of the holder of air before we started the gas machine. That was the way I kept it poor enough to prevent smoking. Thus we worked until the 7th day of July, 1889, and on which day we had a fire that wiped out the town. Having only three or four customers left of course we did not make much gas till the town was built up again.

Becoming convinced before this time that we could not get along with the naphtha plant, we began to look around for some one who would loan us money enough to put up a coal gas plant, and after a good deal of said looking we found a man who said he would let us have the money, but just as he was about to turn it over to us the fire came and upset all his calculations, throwing us all back again. Finally, after a good deal of backing and filling, we succeeded in getting the money, and, on the 16th of November, started up the coal gas plant with fair success. Having a good man to run it we did not have a great deal of trouble that winter, but the next spring the man left to go to Bellingham Bay to build a gas works there. Then our troubles began. I sent to San Francisco for a man for stoker. He came, and of course said he could do anything; that he had worked in a gas house for 20 years. He could shovel coal, and that was all that he could do. We had some trouble with the outlet from the hydraulic main, as tar would collect at the gas outlet and cause back pressure on the retorts. To correct this we bored the end of the main, put in a 2-inch pipe with a stopcock, and when the tar clogged up there we opened the stopcock and let it run out. Our plant consisted of one bench of three, and a skeleton for three more which I had just filled and ready to fire up. I had shown my man this outlet from the main and how to work it. One morning while on my way to the works I met a man who told me to hurry along as the gas works had blown up. I hurried, and when I got there I found everything in confusion, and the man was flying around like a chicken with its head off.

"What's the matter?" I asked. "* * * * if I know," he answered. "I just let the tar run out, and the thing went off."

I found that in running off the tar he had drawn too much water from the main, and the gas had backed down the opposite stand-pipes. There must have been a leak from the retorts into the furnace, so that it all filled with gas, and a small crack in the partition wall furnished the fire. At any rate the front was blown out of my new bench. I guess I said some things more forcible than polite—at least my man stood not on the order of his going, but went at once.

This was in 1890. The town was building up rapidly. Among our other troubles the electric light specter now kept bobbing up. Finally a man came, who claimed to be a representative of the California Electric Light Company, and said that he was sent out by George Rowe to put up an arc light plant here. He went so far as to rent a deep well, and said they would pump water to furnish the town and and also run the arc plant to supply the people with light. Well, the California Electric Light Company was a big bugaboo and we were somewhat scared. There seemed to be only one way to avoid impending doom, and that was to buy an arc plant from the California Electric Light Company. But where was the money to come from? That was the sticker? Through one of the banks here we opened up communication with one of the saving institutions in San Francisco. They finally sent a man here to examine the property. He was somewhat pompous, and, after looking things over, drew a long breath and said: "I am surprised that my people should send me up here to look at such a loan as this. Give me a check for my expenses and I'll go home."

This experience naturally made us feel very pretty blue, but we kept on trying till we finally succeeded in borrowing the money to put in the arc plant; and it was no trifle, either. We started it about the first of October, 1890, and had fairly good success in getting customers for the light. But our troubles over the electric light did not end with the arc plant. Every few months some one would bob up with an incandescent light scheme, who managed to make life miserable for us. I commenced to look around to see what could be done about an incandescent plant, and, among other trips, went to the Kern river canon to examine into the practicability of a transmission plant, and soon became convinced that that was the correct solution of the trouble. It soon began to be talked about, and in a short time a man came up from the city to look the thing over, and from that small start sprang the present Power Development Company.

During the time that the Power Development Company was installing its plant (some two or three years) Mr. O. N. Guldlin, the representative of the Western Gas Construction Company, of Fort Wayne, Ind., came along and persuaded us that we ought to have a water gas plant. That meant we must borrow more money. Well, we finally made arrangements for money, and installed the water gas plant. And yet we were not happy, for we soon found that a water gas plant without a relief holder was not what it was cracked up to be. Fortunately we had a small holder as well as a large one, so we set to work to convert our small holder into a relief, only to find that was not so easy as it seemed.

We laid an extra inlet pipe to go in at the bottom of the holder and intended to raise another standpipe, but when we dug down for the purpose of putting in our extra inlet we struck a large snag. The holder was a wooden one, with six stanchions with railroad iron on the inside for a runway. We found that these were all rotted to just a thin inside shell. To say that we were stumped would be putting it mildly.

Finally, we went to work and drilled the hoops on each side of the stanchions, bolted the next stave to the hoops and took out the stanchions. We then put in new members and bolted back the rails, refilled the tank and started it up. It must have been that we did not get the rails back quite true, for the wheels seemed to bind and cramp. The result was I had just reached home one night when the engineer whistled for me. I immediately returned to the works, and there I found the holder in a deplorable shape. It had come as near to turning upside down as the tank would permit. The wheels on three of the stanchions had been torn completely off, both top and bottom. Well, I am willing to confess that I did not know what to do. We had been running without a relief holder until the customers' pipes and burners had become badly clogged with tar, and we had only just finished getting them into good working order again. To again begin running hot gas into the storage holder would make much trouble, and perhaps ruin our business.

I went back home and "slept on it" that night. In the morning I got two pieces of 8 x 8 x 24 and spiked a 4 x 4 x 24 on one side of each of them. Then I took a ¾-inch gas pipe, drilled and countersunk holes for screws, screwed that on the 4 x 4, and then slipped the whole down between the holder and tank with the gas pipe next the holder, and started it up. It has never given us the least trouble since.

In the course of time the electric transmission line got in, and the Company was prepared to furnish us current according to contract. So we were compelled to run our lines, and wire the town, and do the thousand and one things that are necessary for a distributing plant. Of course, that meant more money, so we had to get out and rustle again; but in time we accomplished that, and are now running a fairly successful business in a small way. My health has been so poor for the past three or four years that I have been compelled to depend largely on my son to attend to the business, and he is now manager of the electric department. In closing, I sincerely wish you all smoother sailing than I have had.

Discussion.

Mr. St. Clair—I would like to say in explanation of this paper that Mr. Parker, of Bellingham Bay, in writing me, stated he wanted something in the way of a history and asked me to send him an account of my experiences at the works, etc. Without having a very clear idea of what he desired I wrote the little history you have heard the Secretary read of the up-and downs (or some of them) which I have experienced.

The President—The next paper is one by our Secretary, Mr. John A. Britton, the title of whose theme is

THE TREATMENT OF MUNICIPALITIES.

The Secretary—This paper is really offered as a substitute. Two of the members who promised to contribute papers failed at the last moment. Mr. Oscar B. Weber, of New York, upon whom I really depended, had promised a paper on "Coal Gas Retorts," but none has come. Mr. L. Kahn, too, promised a very exhaustive paper on "Gas Stoves." I am satisfied from the correspondence we have had that it would have been a good paper that would have provoked discussion. At the last moment, before he had time to complete his composition, he was summoned to New Orleans, on account of the sickness of a near relative, who afterwards died. In the settlement of the estate he was detained there so long that it was impossible for him to finish his paper and send it on. The paper by Mr. Parker finally developed into the book which you have received. It cannot very well be read again as you have all had the opportunity of reading it for yourselves. The introduction and editorial there are practically Mr. Parker's contribution in my name to that part of the programme. Just to fill in the time before Mr. Hollidge gets ready with his "Wrinkles," I will read this paper without promising anything very startling or new.

The Secretary then read as follows the paper the title of which precedes his introductory remarks:

From time immemorial the question of the treatment by quasi public corporations of municipalities with which they have dealings has evoked more discussion than probably any other subject within the attention of such bodies as the Pacific Coast Gas Association.

Usually discussions of such topics have been conducted in secret, and the reading public and the antagonists of corporations have never rightly understood the position occupied generally by gas managers in dealings with municipalities. This secrecy, cloaking and falsely guarding the interests which the managers represent, have given rise on the part of the public generally to a misconception of the attitude towards the public from whom corporations derive their revenues, and through whom the interest upon the capital invested is presumed to come.

In the early days of the gas and electric light industries the necessities for the rapid building up of a plant made over capitalization an absolute essential. Not only has that applied to corporations serving municipalities but to municipalities serving themselves. The history of every gas and electric lighting plant, not only in this country but on the contintinent and elsewhere in the world, has been a history of dollars expended, which in a brief space of time, and often in months, became useless on account of the rapid strides in the development of the industries, and had to be replaced at added cost with newer and more efficient apparatus.

The right of an individual or an aggregation of individuals under corporate title to earn reasonable interest upon monies invested in good faith has been upheld by all the courts in the country. At the same time it has been decreed by these higher tribunals that no more than a reasonable interest should be permitted to be earned.

In the days of the Mosaic law usury was frowned upon and has been forbidden by legislative enactment in all countries and all climes ever since. The rapid growth of our United States, the development of its hidden wealth, the large increase in values of realty, and the immense returns acquired by the advantage of materials necessary for the welfare and happiness of man, have made it possible to accumulate fortunes beyond the dream of the "Arabian Nights' Tales."

The lack of a sufficient hedge about the accumulation of such fortunes in early days, particularly on our own Coast, made the charging of rates for public utilities limited only by the amount which the consumer would pay.

The establishment of a free press and free speech in our domain has made it possible in latter days for the consuming public to voice itself regarding the extremes of charges by corporations. This has been taken advantage of by demagogues and, cloaked under the guise of truth, oppression, not of the people but of capital, has become an everyday occurrence. To the corporation and its managers, who have endeavored by the best efforts that in them lay to produce for the capital entrusted to them that which it was entitled to earn, has been given the necessity of showing to the powers that be their right to the earnings which they have enjoyed.

The ignorance of the masses regarding the cost of manufacture and distribution of different commodities has led them to be governed generally in their estimates of profits by a press and people over zealous to be known as saviors of the people.

The discriminating intellect that should be present in municipal bodies is more than often lacking, and in its place we find, to use a common expression, a desire to "Play to the galleries," sometimes for personal political preferment and sometimes from an honest conviction that they are doing right in assailing the employment of labor and the acquisition of honestly earned dollars.

It goes without saying, however, that many corporations, not only of a quasi-public character, but also those of a purely personal nature, have given reason for this general outcry of the public. Fortunately, in the territory represented by the Pacific Coast Gas Association, this is not so prominent as in other and more thickly settled parts of the country.

The peculiar requirements of gas manufacture, in the direction of materials alone, have placed this territory in a position differing entirely from any other portion, perhaps, of the world. Until a very recent date, at no place within reach of the different cities and towns supplied with artificial light, have the materials for the same been available. Bituminous coals, until the exploration of the field surrounding Puget Sound, were unavailable, except by transportation from foreign countries. This transportation of necessity varied in cost, and in the early days, when nothing but coal gas was manufactured, there was a possibility facing the gas companies of the State of paying at one time as low as $5 per ton for coal and again of paying as high as $15. This is to be contrasted with the general uniform rate for coals of approximately the same character, deliverable anywhere within the Eastern and Western States of our country at a price scarcely exceeding $3 per ton.

Upon the advent of water gas the same difficulties presented themselves, no oil or anthracite coal fields having been developed within the territory. As high as $16 per ton has been paid for anthracite coals, and as high as $4 per barrel for oil. This again is to be contrasted with Eastern conditions, where coal can be purchased as low as $2.25 per ton and oil at 50 cents per barrel.

Within the limits of every city within this territory, with possibly one exception, the distribution of gas is attended with a large expenditure for street mains, all materials for which, as well as for the equipment of the manufacturing and distributing departments of a gas works, had to be purchased in the Eastern States and shipped, at first around the Horn, then across the Isthmus, and latterly by rail, adding in every instance to the cost easily from 50 per cent. to 150 per cent. over the cost of like materials delivered to Eastern companies.

Gas, too, had competition for fuel in its early days with wood, easily and cheaply obtainable, and with gasoline sent out here and sold at very low rates.

The sparsely settled cities forbade in most instances many extensions of street mains, or required a large amount of capital to reach a very meagre consumption. These details are given as an explanation of the high prices which prevailed in the early days in California.

The opening up of the bituminous coal fields, before mentioned, in the Northern part of the territory, the discovery of oil in California, and the bringing to this market of Welsh anthracite coals, have all tended towards the cheapening of the output, and with that cheapening has come a reduction in the price of the manufacture of gas, satisfactory to the public generally, with the exception of promoters and political demagogues.

It is an assertion which cannot be controverted that the rates charged over the entire district of the Pacific Coast will compare more

than favorably with the rates charged in the solidly, built-up Eastern country.

The foregoing but leads to a general explanation of the text of this paper, "The Treatment of Municipalities," and but emphasizes the statements which have been freely made by gas managers that the public in this district has been fairly treated as a rule; but outside of the question of earning a proper interest upon bona fide investments comes the further question of what treatment is justified?

This becomes largely a local question, depending upon the environment and upon the "personality," if such a term can be used, of the corporation.

"The days of '49," a term like "charity" covering a multitude of sins, has not passed for all gas managers, and the pound of flesh is demanded as fiercely as it was by Shylock, and I might add, generally with the same result that befell him.

By the term "Treatment of Municipalities," I am endeavoring to convey not the relations with the governing body any more than those with the public who constitute the municipality.

The manager's duty should clearly be the employment of such men and the education of them to the extent of making his office as easy of access to the impatient, non-reasoning consumer as to the one who, month in and-month-out, pays his bills without even the shadow of a protest.

The demands of the corporate powers, which sometimes are impatient and unreasoning, should be met with equal suavity, and the endeavor to create a pleasant and not an antogonistic feeling should be the watchword over the door of all lighting companies' offices.

There are occasions arising continually in the government of a city or town, when, by miscalculations, which are liable to occur there as in other businesses, there is need for the helping hand of every one connected with and having an interest in the welfare of the city or town. From none is more expected than from him who has of this world's goods a plenty; and from corporations which enjoy rights and privileges granted by an act of the municipality (and which are as a matter of course denied to those not having sufficient capital to take advantage of them), more is to be expected than of the humble householder whose only capacity is to earn daily bread for himself and those dependent upon him.

While necessarily the first thought of a manager of a corporation is that the interests which he represents shall get the benefit of his experience and learning, yet in connection with this should come the thought that perhaps those interests can best be forwarded by caring for that interest which makes it possible for him to be successful.

The agitation at the present time, largely increasing throughout the world, for the management of all public utilities by the power that creates them, is a rock that stands without a lighthouse and upon which many a good ship, well officered, will strike, to go down forever.

That money which has been invested in the past, and which has continually earned for itself a reasonable interest, can best afford to sacrifice some of its capital for the protection of that which is left should be conceded by all reasonable men.

A reorganization of enterprises on the basis of a capitalization adequate to the present needs of municipalities, and not to the accumulated needs of two or three decades, may perhaps be the only solution of such a question. While in some respects it would be an unjust one, it seems to be the only basis upon which competition can be sustained without irreparable injury.

No amount of printed and circulated matter setting forth the disadvantages of municipal ownership can avail against the trend in that direction. What one man has failed in there are always others who think they can make a success of, and nothing will deter them except an absolute failure after trial. Each manager, therefore, in his treatment of municipalities must after all be governed as I have said before by local conditions, into which must be drawn all the good sense and judgment obtainable, with a preparation to sacrifice, if necessary, some of that capital which it has taken years to build up.

[To be Continued.]

Self-Ignition, Far and Near.

[From the London *Journal of Gas Lighting.*]

The self-igniter is proving itself to be something more than an interesting new toy, which some folks, just for the sake of its novelty, may adopt one day and discard the next. Time was when we ourselves were a little sceptical as to its enduring usefulness and qualities; but a longer acquaintance, new improvements, and wider applications have produced a greater faith in it. Without impugning in any way the merits which other gas lighters of this class are said to possess, we may freely say that with the Matchless Gas Lighting Syndicate, Limited, rests the credit of having been the first to take effective steps for developing this system of gas ignition in this country, and what is more, they have not remained content with the igniter—efficient though it was in its action—as originally introduced to the public at the Holborn Restaurant in the autumn of last year; but they have since been applying themselves to its simplification (which means a cheaper article), and to demonstrating its applicability to gas lighting under divers conditions and in all sorts of situations.

One of the most interesting of the installations lately made is at the Waterloo Station of the Southwestern Railway. There the large Sugg lanterns on No. 2 platform have been fitted with the igniters. In all eighteen lanterns have been dealt with—thirteen on one service, and five on another; but, for the purpose of this article, it will suffice to refer only to the former. Of the thirteen lanterns, ten contained tripod burners, and three duplex ones. Each lantern is supplied with one of the Syndicate's igniters on the automatic principle, so arranged that they are not affected by any air contained in the service pipes, which air finds outlet at the burners. This question of the air contained in considerable lengths of service pipes is one which gas engineers have assumed would be a difficulty in applying the system to a long stretch of gas lamps, and controlling them from one point. It was fancied that the air might retard the action of the igniter, with perhaps unpleasant consequences. But in the installation at Waterloo Station, we have, so far as ordinary burners are concerned, proof to the contrary. One day last week, accompanied by the Engineer of the Syndicate, Mr. W. J. Hicks (in which name will be recognized the late manager of the Ascot Gas Company), we visited the station, in order to test for ourselves exactly what the Syndicate were able to accomplish in this way. It was found that altogether the length of service-pipe from which the thirteen lanterns lighting No. 2 platform are suspended is about 300 yards; that it is composed of 1¼ to 1½ inch tubing; and that the whole service is controlled by a 1½ inch Carter valve on No. 1 platform. This was in the daytime, so that the pipes had not been in use for some time previously, and would consequently be well charged with air. At a given signal, the attendant turned on the valve, and in ten seconds the whole of the thirteen lights were doing full duty. Never in the course of our experience have we seen thirteen, or any other number of electric arc lamps come into operation so quickly and with such little fuss. The objectionable hissing, spluttering, and violent fluctuations which occur with electric arc lamps are entirely absent; and silently and almost instantaneously, to the wonderment of those who are not "in the know," the gas lamps are brought into action. Of course, the number of lamps which may be controlled by one valve may be extended to any reasonable extent. There is one point which it is only right should be alluded to; and it is this, that in the case of a number of incandescent lights controlled by one valve, the ignition would not be quite so rapid, as the air in the pipes would not have such a free egress as is provided by these large open burners. To overcome this little drawback, however, the Syndicate are trying to design a valve for the purpose of releasing the air independently of the burners; but, in the meanwhile, the trouble could no doubt be averted by fitting the end lamp on a length of service with ordinary burners which would permit the free escape of the air.

It may be added that some of the igniters at Waterloo Station have been in use about two months; but the majority have been brought into service within the last three weeks. In reply to inquiries, the Railway Company's lamp attendant stated that he has experienced no difficulty with them, and that in their action they have been all that could be desired. They were fitted by the Railway Company's own men, and subsequently, to insure success, Mr. Hicks simply looked to the adjustment of the platinum pill. It is anticipated that they will run for about twelve months, without the renewal of the pill, provided no adventitious mishap occurs. The vibration caused by the trains has not affected the adjustment in the slightest degree. It may be that they will require occasional attention, but this will be more than compensated for by the saving of time, labor and gas which must result from the facility of lighting up and extinguishing these highly-placed lamps. And, moreover, during the busy evening hours, passengers will not be worried with the "By your leave" of the lamplighter and the obstruction which that hitherto necessary official has at times unavoidably caused in performing his duties. In the case, too, of small country railway stations where the coming and going of trains are an infreqent occurrence, and the price of gas is dear, the advantage of

self-igniters would be represented in a year by a very appreciable monetary saving. In connection with railway lighting, another novel application of the igniters may be mentioned—that is, in the maintenance of the signal lights in tunnels. Experience has shown that the violent draughts caused by the passage of express trains through tunnels will ofttimes extinguish these signal lights; but the self-igniter has furnished the means of meeting such a contingency, and its employment for the purpose promises considerable extension.

Having given these illustrations of the success of the igniter in lamps fixed at a distance from the controlling point and in elevated positions, there are two or three improvements which the Syndicate have introduced to which attention may here be directed. One is a very sensible modification in the construction of the igniter for ordinary purposes—for both common and incandescent burners, in street and domestic lighting. It is the substitution of a two-way lever cock or tap for the automatic mechanism. With the new arrangement, to produce the incandescence of the platinum pellet, the tap is turned completely over to the right, and then immediately brought back to a central position, on which the jet of gas ignites. The action is so quickly performed that the half return movement is scarcely perceptible, and the lighting is almost instantaneous. The only difference between the new igniters for ordinary and incandescent lighting is that those supplied for the latter have longer stems for supporting the lighting medium than those required for the former.

The advantages of the new type of igniter may be summed up thus: There is no automatic mechanism to get out of order, and the only part that can perish is the platinum pellet, which, however, with fair usage, will last twelve months, and can be renewed for a few pence. Then the ignition is quicker with the two-way tap than with the automatic mechanism; and further the lighter can be produced at less cost, and consequently sold at the reduced figure of 2s. 6d. For situations where the igniting medium is exposed to danger, the Syndicate have also devised a neat little guard. At their offices, they also show an ingenious application of the igniters to chandeliers; and the arrangement is, of course, applicable to other pendant lights. At the top of the chandelier is a spring lever, operated by a fine cord, which can be carried to any convenient part of a room. By drawing the cord downwards, and attaching it to a hook, all the lights are put into operation; and by simply releasing the cord again, they are instantly extinguished. To some readers these may appear trifling matters; but it is knowledge of these small points which the gas manager finds useful in meeting the competition of the electric light when arguments as to its ease and convenience are thrown in his face.

The Estimation of Oxygen in Coal Gas.

In a recent issue of the *Jour. für Gasbeleuchtung*, Dr. H. Lubberger, discussing the subject named in the heading, said:

The estimation of the oxygen contained in coal gas is not any easy operation, as it constitutes hardly 0.2 or 0.3 per cent. of the total volume; that is to say, with the ordinary gasometric apparatus we have to measure 0.2 to 0.3 c.c. of gas. It is, however, important to have a method enabling us to estimate exactly the oxygen in ordinary coal gas, considering that it is more and more recognized that a small addition of air to the raw gas helps the purification very considerably.

It is evident that as the apparatus of Bunte or of Hempel do not allow of a volumetric determination, we might perhaps make use of Rüdorf's apparatus. With a receiver of 1 liter capacity each per cent. of oxygen would be represented by a diminution of volume of 1 c.c. But the readings would be false, inasmuch as other gases accompany coal gas, as well as oxygen, and they would be absorbed in quantities too great to overlook.

The process lately described by Dr. Pfeiffer (*Journ. f. Gasbeleuchtung*, 1897, p. 356) for estimating the proportion of oxygen contained in coal gas, necessitates the use of an empirical solution of caramel, which would certainly not remain unchanged for years, which is a serious inconvenience.

I have attempted to modify E. W. Winkler's process (*Berichte*, 1888, xxi., II., 2,843), in such a manner as to make it applicable with Bunte's burette.

This process depends on the oxidation, by means of the oxygen dissolved in water, of an alkaline solution of manganous hydroxide to the state of manganic hydroxide. By adding potassic iodide and hydrochloric acid, a quantity of iodine is set free equal to the amount of oxygen dissolved, and it is only necessary to titrate with a solution of hyposulphite to estimate the quantity of oxygen present. The following are the reagents necessary:

1. A solution of potassic iodide; 10 grms. of caustic soda, 15 grms. of crystallized Seignette salts, and 8.5 grms. of potassic iodide are dissolved in 300 c.c. of water.

2. A manganous solution; 14.5 grms. of manganous sulphate ($MnSO_4 + 5H_2O$) in 100 c.c. of water.

3. A centinormal solution of hyposulphite of soda; 2.48 grms. of hyposulphite ($Na_2S_2O_3 + 5H_2O$) dissolved in 1 liter of water.

It is further necessary to have water free from air prepared by Pfeiffer's method (*Journ. f. Gasbeleuchtung*, 1897, p. 356).

To introduce the gas to be analyzed into the burette, the latter is filled with water, and the gas passed in through the upper tap. The lower tap is then closed, and the upper one turned through an angle of 180°.

During this operation the gas being in the burette under pressure drives the air out from the passage through the tap. The tube through which the gas is passed is then removed, and the outer side of the tap is covered with a short piece of indiarubber tube plugged with a bit of glass rod. About 5 c.c. of water free from air are poured in through the funnel, and allowed to run into the burette in such quantity that it forms a layer of about 1 c.c. above the lower tap. The lower tap is then carefully opened, and enough water allowed to run out to fill the capillary tube which is above and below the tap.

This method of working applies to the case of a sample of gas taken from a pipe where it is under pressure, but when the gas has to be pumped from the pipe it is necessary to fill the taps with water at first to prevent any air entering the burette during the subsequent treatment. The burette thus filled is fixed on its support, and water free from air is passed in through the upper end, up to the third degree above zero, and the excess of gas is allowed to escape through the 3-way tap, the funnel being full. After reading the level the water is run off down to the tap and the funnel emptied.

The further treatment of the gas varies according to whether the sample of gas was taken before or after passing through the purifiers; that it is to say, according to whether it contained sulphureted hydrogen or not.

1. *Gas Taken after Purification—That is to Say, Free from Sulphureted Hydrogen.*—One c.c. of manganous solution is passed in by the upper tap, and then 30 c.c. of potassic iodide solution by the lower tap. The burette is then well shaken in such a manner that the liquid contained in it passes up and down the whole length of the burette at each shake. This operation is continued for 10 minutes; after this, 1 c.c. of concentrated hydrochloric acid (as 25 per cent.) is passed in through the lower end, and the whole turned over. In the case of a gas containing oxygen, iodine is set at liberty. The funnel is then filled with ordinary distilled water, and the contents of the burette are then transferred to a beaker. We then add a little 1 per cent. starch, and titrate with centinormal hyposulphite of soda until the blue color disappears. It is necessary to subtract 0.3 c.c. from the volume of hyposulphite used, and the proportion of oxygen present is then calculated, each 1 c.c. of hyposulphite being equivalent to 0.06 c.c of oxygen; that is to say, 0.06 per cent. by volume when we take 100 c.c. of gas. We can perform the whole operation in the same burette, but in this case the correction to be made would be 0.06 c.c.

2. *Gas Taken before Purification—That is to Say, Containing Sulphureted Hydrogen.*—As sulphureted hydrogen interferes with the operation, and is not without action on the reagents employed, it should be previously removed. After running off the water 2 c.c. of iodine solution (5 grms. of iodine and 10 grms. of potassic iodide in 100 c.c. of water) are passed into the burette by the lower tap, and shaken vigorously several times.

The solution of iodine is run off, and the last traces removed by washing with the smallest possible quantity of water free from air, introduced by the upper tap. The last washings should be without action on starch. Continue the operation as in the first case.

Analysis gives the following results:

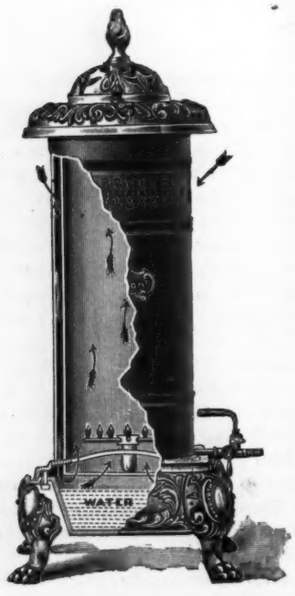
Oxygen Added.	Oxygen Found.	Oxygen Added.	Oxygen Found.
0.104 c.c.	0.099 c.c.	0.313 c.c.	0.297 c.c.
0.104 "	0.111 "	0.418 "	0.427 "
0.209 "	0.204 "	0.418 "	0.409 "
0.209 "	0.186 "	0.627 "	0.657 "
0.209 "	0.210 "		

The small differences arise from the fact that we take 1.0 c.c. of hyposulphite as being equivalent to 0.06 c.c. of oxygen, without allowing for temperature and pressure. But as this is purely a commercial method such small differences may be neglected.

The Vulcan Hygienic, Double-Cylinder Gas Heater.

The Vulcan hygienic, double-cylinder heater is the most recent of the improved gas heating devices brought out by the W. M. Crane Company, of New York, which construction marks a fairly long step in the way of solving the very difficult problem concerned in gas heating without a draft.

In the Crane Company's double cylinder heater, patented this year, the air is admitted near the top of an ornamental line of perforations in the outer cylinder, which is joined at the top through an air-tight connection with the inner cylinder. The latter is open, at the base, over a water pan, firmly held in the closed castings supporting the stove, and to which the bottom of the outer cylinder is tightly joined. The burners are within the lower part of the inner cylinder, and directly above the water pan, as a reference to the illustration will show.



In use the air is drawn through the perforations of the outer end, down and over the surface of the water pan, from which it takes up vapor thence carried into the flame, the nitrogen of the water combining to aid combustion. A portion of the oxygen, being set free and not consumed, is carried with the now thoroughly heated and flame-purified air current, upward and out again by means of the open work of the ornamental casting forming part of the stove. The aim of the inventor was this: Combustion being assisted by a perfect supply of fuel constituents in the air currents, which reach the burner at a temperature preventing the chilling of the flame, he concluded that perfect consumption of gas was secured and that no poisonous residue was thrown off, thus guaranteeing a moist, healthful, purified and sterilized atmosphere, the control of which is at the command of the householder.

The heater vaporizes about eight quarts of water daily when in constant use. The Crane Company says it has thoroughly tested it, and offers it without reserve as to its claimed merits, to the gas companies of the country and their patrons.

The Hemingway Coking Process.

Iron Age says that its readers have been advised from time to time of experiments being made in coking the low grade coal of Illinois and Indiana. Fairly successful results were obtained in several of these experiments, exciting strong hopes among those interested that the problem had been solved and that the West would soon thereafter be producing its own fuel of this character. The Illinois Steel Company expended considerable money in investigating by-product or retort furnaces for this purpose, and would probably have had a coking plant in operation at Chicago some years since but for the serious business depression of 1893 and the years following. They have not abandoned the project, but may take it up at any time, when other important matters are less pressing. Several of the other efforts in this line were dropped either because the processes of coking were too expensive or because proper financial backing could not be secured. The latest effort to coke native coal at Chicago, and the one which promises to fulfill long entertained expectations, has been made under the direction of Levi Z. and Joseph Leiter, both of whom have more than local fame as men of great commercial enterprise and business sagacity. They have supplied the necessary funds to enable experiments to be conducted on a proper scale by Joseph Hemingway, who has had long experience in treating Western coal and has invented several processes for coking, distillation, etc. For several months Mr. Hemingway has given an oven of his design comprehensive practical tests at 44th street and Wentworth avenue, Chicago, the fact being known to very few persons. Ton lots of coal from mines in many portions of the West were received and treated in this oven with results which were so uniformly gratifying that four ovens are now being built at 34th and Iron streets, where much more room is available and where railroad and river facilities exist for handling materials easily and economically as the plant grows. In these four ovens, which are of large size, coal will be tested on a greater scale from various mines, and a decision will be made as to which is the most suitable for coking.

The oven in use in this process is of the beehive type, which is so common in Pennsylvania and other coke producing States. It differs from the ordinary beehive, however, in being fitted with a hot blast, obtained by blowing air over an incandescent bed of coal, but some other parts of the process are not disclosed, as they are not yet covered by patents. Mr. Hemingway states that this process not only produces coke from coal hitherto regarded as non-coking, but that it eliminates a considerable part of the sulphur that may be found in the coal, and further that it will turn out coke in 12 to 13 hours equal to the usual 48 or 72 hour coke. Ovens of this character will cost much less than retort or by-product ovens if the production of coke is alone sought. They can be equipped for saving by-products under another of Mr. Hemingways patents if that should be desired.

These processes are owned by the Universal Fuel Company, just incorporated in New Jersey with a capital of $1,000,000. Subsidiary companies will be organized in coal mining towns or in localities in which coke ovens can be economically located, taking licenses from the parent company. It is expected that coke ovens of this type will be built at several points in Illinois and Iowa in the next few months, as a ready market exists for coke at the reasonable price at which it can then be furnished. Should the anticipations of the inventor and his backers be completely realized when their coking plants are in commercial operation in the West a great industrial change will take place. At first small manufacturers and domestic consumers will probably be the purchasers of all the native coke. But eventually it will be used by iron and steel manufacturers to reduce their cost of production.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Dr. J. S. Lawrence, President of the Consolidated Railway, Gas and Electric Company, of Charleston, S. C., died at Capon Springs, Hampshire county, W. Va., the afternoon of the 5th inst. Dr. Lawrence had been sojourning at the Springs in the hope that relief would be afforded him from the disease under which he had long been a patient sufferer.

Mr. F. W. Stone, Superintendent of the Ashtabula (O.) Gas Company, writing to the Journal under date of the 14th inst., says: * * * It gives me pleasure to say that business continues very good with us. We have three times as many customers and are selling three times as much gas as in 1896. We have this season enlarged our plant by the addition of an Adam Weber bench of 6's, new purifying boxes, new exhauster and a plant for screening and sizing coke. These improvements of course made necessary some additions to the buildings. We are still making friends, and I see no reason why we should not make a proportionate increase in '99–1900.

Mr. George D. Roper, of the Eclipse Gas Stove Company, writing to the Journal from Rockford, Ills., under date of the 12th inst., informs us that the press accounts of the damage to the Company's factory, which damage was occasioned by a thunderstorm that beset Rockford on the the 11th inst., were much overdrawn. The factory was struck by lightning, but the resulting fire did comparatively little harm, the main loss being chargeable to water. The factory and shops are now in good working order.

Mr. Thomas D. Miller, General Manager of the Dallas (Tex.) Gas and Fuel Company, writing to us under date of the 8th inst., says:

To the Editors American Gas Light Journal: In my remarks on Mr. Fred. B. Wheeler's paper[1] (page 13, issue of the 3d), I fear I have inadvertently done an injustice to the management of the Fort Worth (Texas) plant. My remarks should have been so worded as to express as my opinion of what was to be expected instead of being stated as a fact. Mr. J. C. Lord assures me that my anticipations were not realized. I would, therefore, correct my remarks as follows: "At Fort Worth they began the free service business, and it appeared at the time as though a great many free services would be put in to be used only for a month or so, and there would be a good deal of loss to the Company not only in the cost of the services, but also a loss of gas because of leaky services. In order to follow in the line of progression, we decided to put them in and to charge the regular price for them."

[1] "Problems in New Business: Some History and Experiment."

THE Jones & Lampson Machine Company, of Springfield, Vt., is making extensive improvements to its plant, and has let the contract for a new steel building, 60 feet wide and 95 feet long. The building is to be constructed by the Berlin Iron Bridge Company, of East Berlin, Conn., and the structure has many special features which make it especially interesting to constructors.

MR. T. S. PORTER is informed that the system which the recently incorporated Lakeville (Conn.) Gas Company proposes to employ is of the acetylene type.

A CORRESPONDENT at Sacramento, Cal., incloses the following: "The transfer of the property of the Napa (Cal.) Gas Light and Heating Company and the Napa Thomson-Houston Electric Company has been formally made to the Napa Gas and Electric Company. Mr. O. E. Clark, Superintendent of the Electric Company has been elected Superintendent of the new Company; but Mr. T. R. Parker, who has been Superintendent of the Gas Company has consented to remain with the new concern for a few months. Mr. J. G. Whittington, of San Francisco, Secretary and Treasurer of the new Company, says that the plants will be consolidated as soon as it is possible to do so.

A GAS works is proposed for Clinton, Ills., and on its face the scheme looks a good one, despite the fact that its population is rather under than over 4,000, for the residents are of the solid sort. It is the capital of De Witt County, and is located on Salt Creek, midway of Decatur and Bloomington. It can be reached by way of the Illinois Central Railroad. It has important manufactures of pumps and wagons.

MR. J. G. WHITTINGTON, Secretary of the Napa (Cal.) Gas and Electric Company, has notified the shareholders that a special meeting of the Company will be held in the Claus Spreckels Building, San Francisco, the afternoon of the 18th prox. The purpose of the meeting is to vote upon a proposition to bond the Company in the sum of $100,000.

THE capital stock of the Portsmouth (O.) Gas and Electric Company has been increased to $200,000.

THE employees of the Cincinnati Gas Light and Coke Company and of the local electric light companies, have organized a fraternal and benevolent organization, under the title of the Gas and Electric Light Mutual Aid Association.

AT the annual meeting of the New Bedford (Mass.) Gas and Edison Light Company the following result was reached. It was voted to reduce the number of Directors from 13 to 11, and that a quorum of the Board should be six. The Directors elected were Messrs. H. G. Howland, Thos. H. Knowles, John P. Knowles, Jr., Charles R. Price, George R. Stetson, Chas. H. Lawton, F. Taber, A. G. Pierce, Oliver Prescott, Jr., John S. Perry and H. M. Knowles; Treasurer and Clerk, Charles R. Price.

THE Common Council of Richmond, Va., like the idiots that they are, voted down the proposition to expend $21,500 on absolutely necessary betterments (or, rather, essential repairs) to the Richmond city gas works. That sum had been recommended, as heretofore reported in the JOURNAL, by a special committee appointed to consider the matter.

THE works of the Hollidaysburg (Pa.) Gas Company were sold under foreclosure sale on the 10th inst. The seller was the Merchants' Trust Company, of Philadelphia, and the purchasers were local capitalists. The amount of the mortgage was $20,000, and the property brought a shade under that sum.

THE Stamford (Conn.) Gas and Electric Company proposes to extend its electric lighting service to the outlying town of Darien, so Superintendent Crawford says.

WE understand that Mr. George Warnking has been appointed Manager of the Oshkosh (Wis.) Gas Light Company.

MR. H. A. ATWOOD, Superintendent of the Plymouth (Mass.) Gas Light Company, is busily engaged in overlooking the many notable betterments that are being made upon the plant. After much persuasion he at last got his Directors to the point of authorizing the necessary expenditure, and they will be more than pleased with themselves and their Superintendent next spring when they count up the good that came to them through the works' extensions. The largest item in the betterments is a holder to rest in a steel tank that is being constructed by Messrs. Deily & Fowler, of Philadelphia.

MR. C. M. Holmes, President of the Santa Ana (Cal.) Gas and Electric Company, died at his home in that city on the evening of the 9th inst

A CORRESPONDENT in Chambersberg, Pa, forwards the following: "The stockholders of the Waynesboro (Pa.) Gas Company have perfected the following executive management: Directors, J. H. Stoner, J. C. Criswell, J. M. Wolff, J. R. Hoeflich and T. B. Smith; President, J. C. Criswell; Treasurer, J. H. Stoner; Secretary, T. B. Smith.

THE estate of James R. Langdon, of Montpelier, Vt, has awarded to the Berlin Iron Bridge Company, of East Berlin, Conn., a contract for the construction of a bridge to be 70 feet in length, and to be 26 feet clear, in the roadway, with a 6-foot sidewalk on each side. The structure is to be a riveted lattice, through bridge, with heavy steel joists capable of supporting heaviest traffic.

AN exchange says that an English jury has virtually decided that a gas company cannot be libelled. It didn't require a jury to sit on that matter in the United States; for we all know how it is here.

THE Philadelphia Suburban Gas Company proposes to extend its mains to and through the borough of Ridley Park.

A CORRESPONDENT in Philadelphia, writing under date of the 14th inst., says: "I saw Mr. * * * recently. He tells me that the Vincennes (Ind.) Gas Light Company, the Vincennes Electric Company and the Vincennes Electric Street Railway, were sold during the past week to a syndicate, the moving spirits in which are the Messrs. Hambleton of Baltimore, Md. While I have no particulars so far, I presume this is the result of the attack by the City Council upon the Vincennes Gas and Electric Companies, an outcome of which was the giving of the street lighting for 10 years to a firm in Chicago, whose backers declared that they proposed to erect an electric plant and furnish lights of the arc description at the rate of about $60 per annum."

THE Society of Gas Lighting enjoyed the usual August outing at the Squantum Club, "of Providence, R. I.," in the second week. The host was Mr. A. B. Slater, of the Providence Gas Company, and his guests were many.

MR. J. E. CARTER has been appointed Superintendent of the Selma (Cal.) Gas Company.

THE Boston (Mass.) Board of Gas and Electric Light Commissioners has approved the issue of $30,000 of stock and a like issue of bonds by the proprietors of the Heat and Power Company, of Marion, Iowa, which was incorporated under Massachusetts laws. The Company was formed some months ago, but its proprietors thought there would be better sentiment over its securities were the latter directly passed upon by Massachusetts instead of Iowa.

THE proprietors of the Brockton (Mass.) Gas Light Company have readjusted their selling schedules. Under it the gross price remains as before ($1.75 per 1,000), but the concession for prompt payment is increased to 35 cents, from 25 cents per 1,000.

Engineering Record notes that a submerged pipe at Atlantic City, N. J., which gave considerable trouble for several years, was taken up in 1898, under the direction of Mr. W. C. Hawley, Assoc. M. Am. Soc. C.E., superintendent of the city water works. The pipe was 20 inches in diameter and about 500 feet long. When it had been taken up it was found that an insufficient quantity of lead had been used in the flexible joints, and that the bells of the pipe were not of the proper form to retain the spigots with the spherical casting of lead. The result was that many of the joints pulled apart as they were lifted from the bottom, but it was believed that by the exercise of care in relaying and the use of some new pipe, most of the old main could be put in service again. After about 100 feet of the pipe had been relaid, one of the joints close to the shore pulled apart, and it was therefore decided to use new pipe throughout, which new pipe was purchased and laid at a total cost of about $3,500, including a slip joint at each end to allow for any expansion or contraction.

MUNICIPAL lighting of streets is referred to in a recent report by Messrs. McMath, Flad and Hermann of the Board of Public Improve-

(*Continued on page* 294.)

THE AMERICAN GAS LIGHT JOURNAL

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AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, AUG. 21, 1899.

(*Continued from page* 293.)

ments, of St. Louis, which is particularly noteworthy because it advises the use of incandescent gas mantles, in place of electric lights, for a number of situations. The substance of the report is given in the following quotation: "1. That the cost of lighting the city by electric lamps or by incandescent gas mantle lamps would be practically the same. 2. That a large volume of light, which will in a measure illuminate the buildings as well as the streets, is wanted in the business district, and an even distribution of light by means of small units in the residence district. 3. That the city blocks in the business district are nearly square in form, and average about 400 feet in length, thus making it possible to light the streets with arc lamps, located at the street intersections only, a condition which is peculiarly favorable to economical lighting with arc lamps. 4. That the city blocks in the residence district are generally oblong in shape, many of great length, 1,200 to 1,800 feet, and that small units of light have an economical advantage for lighting long blocks with a few street intersections. 5. That incandescent electric lamps on streets in the residence district are objectionable on account of the overhead wiring necessarily strung along the sidewalk and over intersecting streets. 6. That the trees in the residence district prevent the proper distribution of the light from an electric lamp. 7. That an electric arc lamp in the residence district is an annoyance to the residents of the immediate vicinity."

The Purification of Acetylene.

Mr. P. Wolff, writing on this topic, says that the average composition of acetylene obtained by means of carbides of Swiss and of American manufacture is as follows:

	American. Per Cent.	Swiss. Per Cent.
Acetylene	99 87	99.87
Phosphoreted hydrogen	0.04	0.02
Sulphureted hydrogen.	0.02	—
Ammonia	0.06	0.04

Carbides of recent manufacture give a gas which contains less sulphureted hydrogen, and no trace of silicinreted hydrogen. The quantity of sulphureted hydrogen is always less when the generator contains a large excess of water. A judicious choice of raw materials enables us to reduce the amount of ammonia and phosphoreted hydrogen to a few hundredths per cent.; but even such small quantities are still of serious inconvenience.

The method of purification proposed by Frank gives good results; it consists in using acid solutions of certain metallic salts, particularly chloride of copper. A part of the acetylene is transformed into aldehyde.

The author proposes the use of chloride of lime containing a small quantity of an alkaline chromate. The free chlorine is thus absorbed, and the acetylene does not undergo any decomposition.

Frank states that the acid solution of the metallic salt which he uses can be placed in an enameled vessel, and that the quantity of aldehyde formed is very small. He claims that 1 liter of his solution will purify 14 cubic meters of acetylene, and that it can be regenerated by boiling, followed by aëration.

New Artificial Fuel.

The *Electrical World* says that Berlin journalists are busy pursuing the reported invention of artificial coal by one Herr Montag, of Mannheim. His latest statement declares that from the point of hygiene his artificial coal is preferable to ordinary coal, as it does not develop poisonous gases, creates but little soot, and leaves no slate and but a small amount of ash, the latter resembling wood or cigar ash; further, there is no danger of explosion or conflagration. The fuel is composed of 92.94 per cent. of ordinary earth, and 6 to 8 per cent. of chemical ingredients, and is cheaper and better than coal. Any piece of land, even if unfit for agriculture, can be used to produce this fuel. The cost of the necessary plant is very low, the price of a machine being only $3,750. Patents for the invention have been taken out in 17 countries.

The Market for Gas Securities.

The feature of the city gas situation for the week was a petition to the Courts, by a stockholder in the New Amsterdam Gas Company, for permission to examine the Company's books, to determine whether or not the rate of 50 cents per 1,000 cubic feet (the selling price established by the Company) was sufficient to enable it to conduct its trading without loss. The initial arguments were made last Wednesday, and the case was put over until to day (Friday) for further presentation. At this writing no further advices respecting the matter are at hand. It looks, however, that the time for readjustment, of the rate schedule at least, is close. Consolidated sold down to 174 and up to 182, during the week. To-day at noon sales were made at 181½. Other city shares are higher.

Brooklyn Union is 140 bid; Peoples, of Chicago, is 121½; Baltimore Consolidated is 63; Laclede common is 57¼ to 58; Bay State is 2½ to 2¼, and Cincinnati is 192. The real feature of the week in the outside market is the remarkable strength shown by Detroit gas, which is virtually at par. The gas share market as a whole has not shown greater strength for 10 years or more.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

AUG. 21.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	182	182¼
Central Union, Bonds, 5's.	3,000,000	1,000	107½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	260	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	.	
New Amsterdam Gas Co.	13,000,000	100	39⅜	39½
Preferred	10,000,000	100	57½	58½
Bonds, 5's	11,000,000	1,000	100½	101
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000		112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	.	
Standard	5,000,000	100	112	120
Preferred	5,000,000	100	135	145
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	140	..
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	2⅛	2¼
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	40	..
" 1st Mtg. 5's	450,000	1,000	95	98
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	8	9½
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	70	75
1st Mortgage	1,207,000	1,000	106	108
Consumers, Jersey City	2,000,000	100	95	.
" Bonds	600,000	1,000	107½	110
Cincinnati G. & C. Co.	8,500,000	100	192	195
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	63	.
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	880,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	97	98¼
" Prior Lien 5's	4,546,000	1,000	94¼	94¾
Detroit Gas Co., 5's	423,000	1,000	99	99½
" Inc. 5's	31,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	.
Hartford	750,000	25	..	230
Indianapolis	2,000,000	..	122	128
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co	250,000	50	50	..
" 1st Mtg. 5's	250,000	1,000	96	100
Jersey City	750,000	20	225	275
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	108
Laclede, St. Louis	7,500,000	100	57¼	58
Preferred	2,500,000	100	98	100
Bonds	10,000,000	1,000	107	108
Madison Gas & Elec. Co.	400,000	100	82	85
" 1st Mtg. 6's	350,000	1,000	102	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53¼	55
" Bonds	750,000	..	..	..

Peoples G. L. & Coke Co., of Chicago	25,000,000	100	121¼	121½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111½	112
" 2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	215	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	70	73
St. Paul Gas Light Co	1,500,000	100	50	52
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96	99
Syracuse, N. Y.	1,750,000	100	..	13
Bonds	1,612 000	1,000	81	84
Washington, D. C	2,600,000	20	275	..
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	99	100
Bonds, 5's	3,830,500	.	106	108
Wilmington, Del.	600,000		214	..

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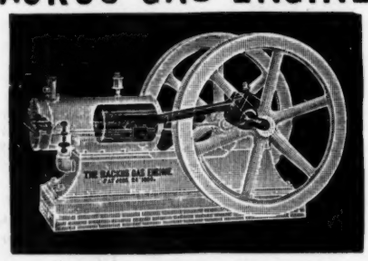

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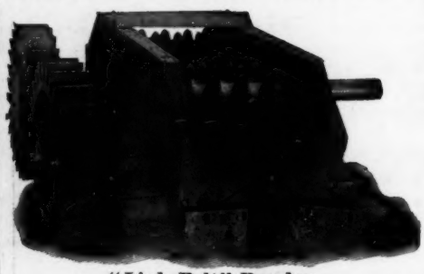

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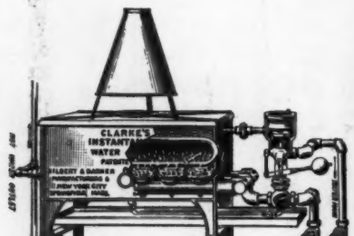

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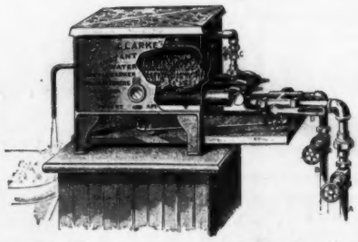

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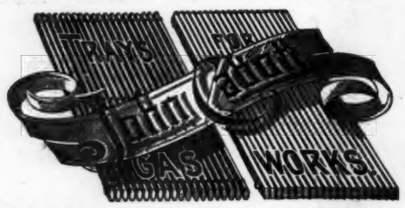

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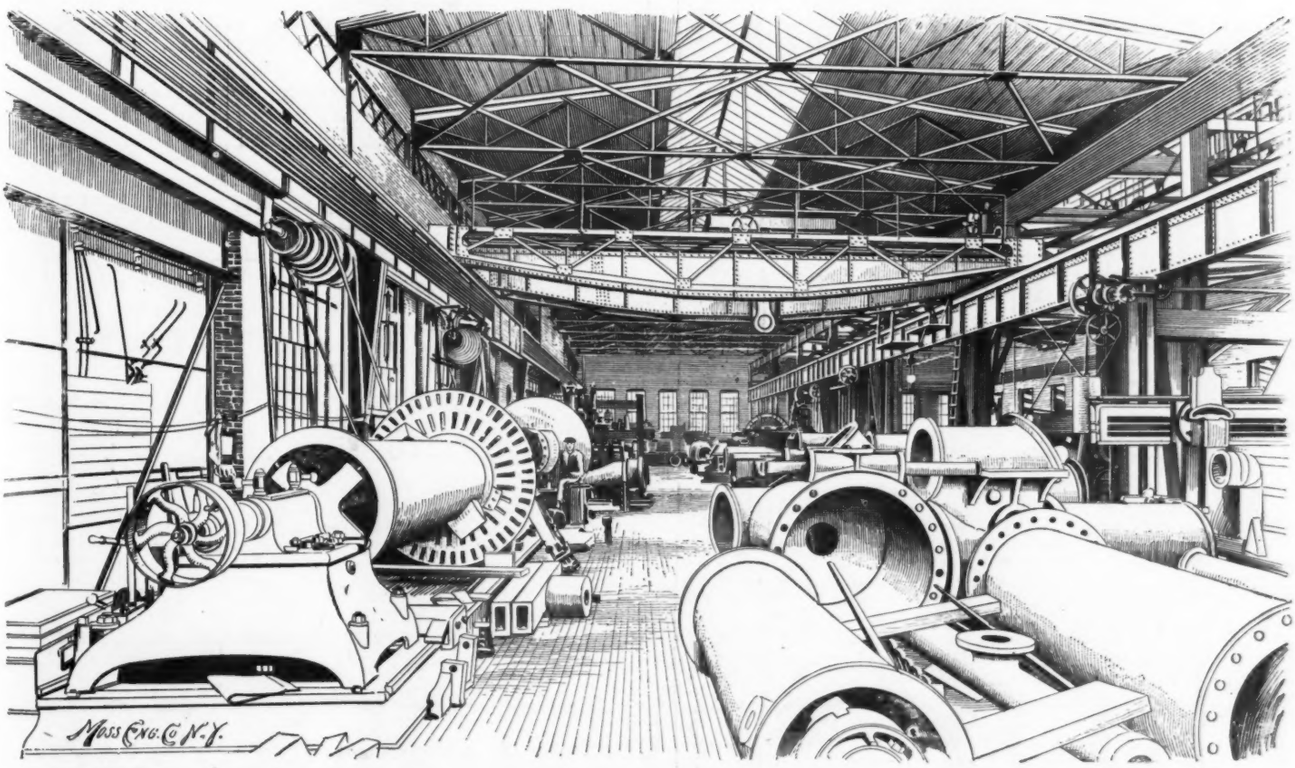

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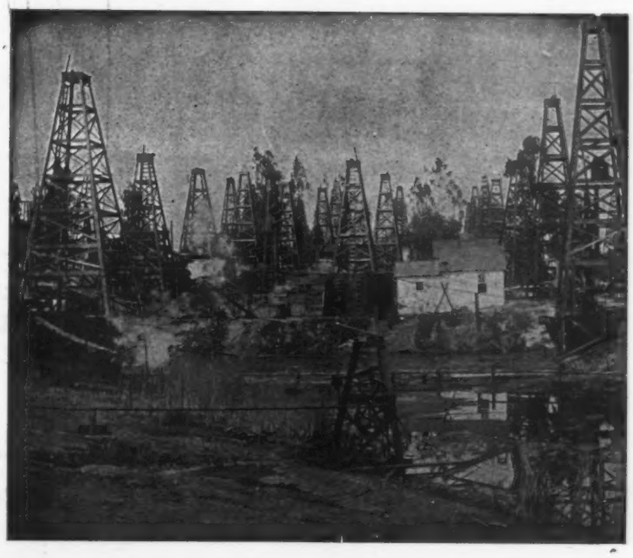

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—AND—

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The Most Perfect Gas Governor on the Market.

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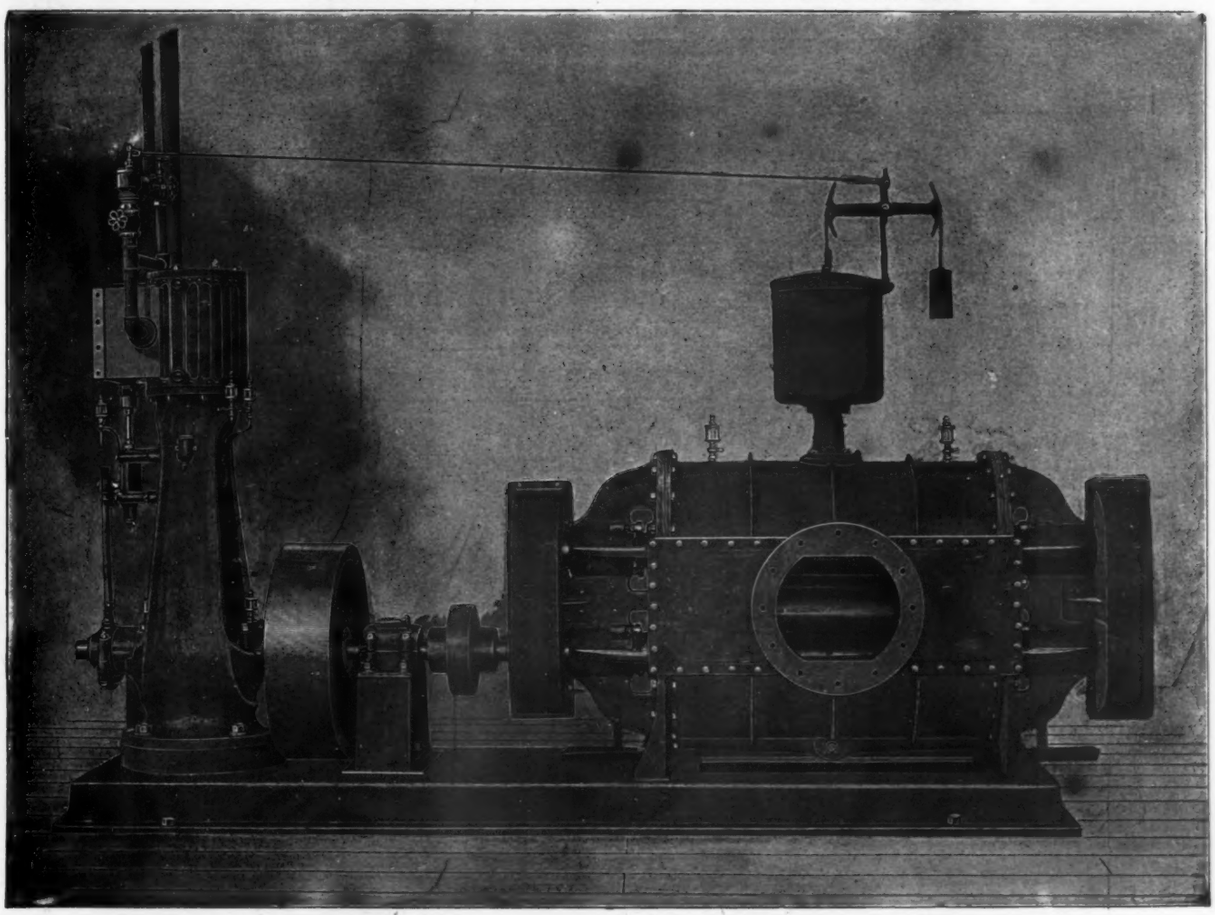
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



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—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

STYLE No. 81.

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Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

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Where there are no gas mains already laid, we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, enabling Gas Companies to furnish a uniform light in all localities.

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This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

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With Instructions for Care and Working of the Same.

By G. LIECKFELD, C.E.

Translated with Permission of the author by GEO. M. RICHMOND, M.E

Price, $1.00.

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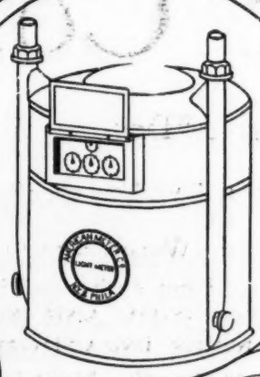
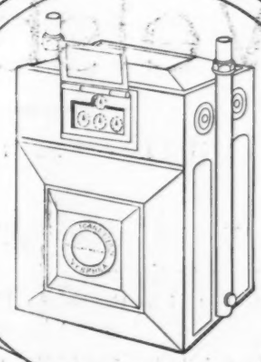
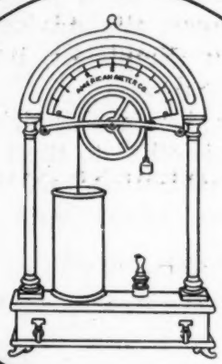


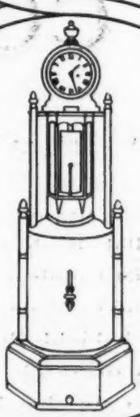


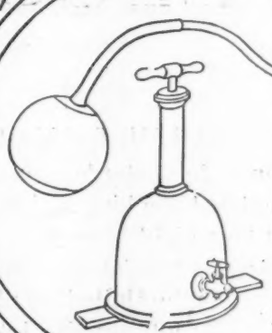


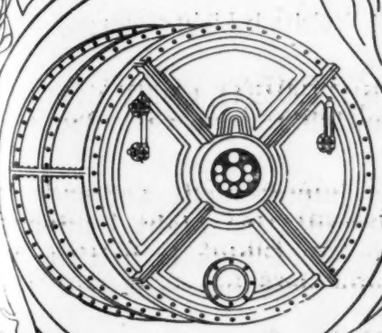
PUBLIC LIGHTING TABLE.

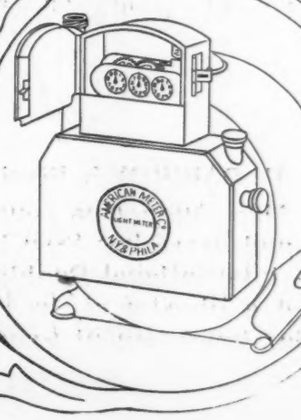
SEPTEMBER, 1899.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	7.10 PM	4.30 AM	6.30	4.20
Sat.	2	7.10	4.30	6.30	4.20
Sun.	3	7.00	4.30	6.15	4.30
Mon.	4	7.00 NM	4.30	6.15	4.30
Tue.	5	7.00	4.30	6.15	4.30
Wed.	6	7.00	4.30	6.15	4.30
Thu.	7	7.00	4.30	6.15	4.30
Fri.	8	7.00	4.30	6.15	4.30
Sat.	9	7.10	4.30	6.15	4.30
Sun.	10	7.50	4.40	6.05	4.40
Mon.	11	8.40	4.40	6.05	4.40
Tue.	12	9.40 FQ	4.40	6.05	4.40
Wed.	13	10.40	4.40	6.05	4.40
Thu.	14	11.50	4.40	6.05	4.40
Fri.	15	1.00 AM	4.40	6.05	4.40
Sat.	16	2.20	4.40	6.05	4.40
Sun.	17	3.40	4.40	5.55	4.50
Mon.	18	No L.	No L.	5.55	4.50
Tue.	19	No L. FM	No L.	5.55	4.50
Wed.	20	No L.	No L.	5.55	4.50
Thu.	21	6.30 PM	8.00 PM	5.55	4.50
Fri.	22	6.30	8.40	5.55	4.50
Sat.	23	6.30	9.20	5.55	4.50
Sun.	24	6.20	10.10	5.40	5.00
Mon.	25	6.20	11.00	5.40	5.00
Tue.	26	6.20 LQ	12.00 AM	5.40	5.00
Wed.	27	6.20	1.00	5.40	5.00
Thu.	28	6.20	2.00	5.40	5.00
Fri.	29	6.20	3.00	5.40	5.00
Sat.	30	6.20	3.50	5.40	5.00









TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166,50	April	298.50
May	158.00	May	264.50
June	140,50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45

OFFICE OF THE

Welsbach Light Co.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23, 1899.

To the Stockholders of the Welsbach Light Company:

In answer to the many inquiries received from the stockholders as to whether the Welsbach Light Company is interested in the Kern Light or the Kern Incandescent Gas Light Company, I am authorized by the Board of Directors of this Company to advise you that **THIS COMPANY IS NOT NOW AND NEVER HAS BEEN INTERESTED IN EITHER THE KERN LIGHT OR THE KERN INCANDESCENT GAS LIGHT COMPANY. The Kern Light, or, to designate it more properly, the Kern Bunsen Burner for use with an incandescent mantle, and the United States patents upon which it is based, were offered to this Company, which refused to purchase them upon the advice of its experts, Dr. Charles F. Chandler, of Columbia College, and Dr. Waldron Shapleigh, its Chief Chemist, and of its Patent Council, Mr. John R. Bennett, of New York City.**

This Company is not now and never has been interested in the Welsbach Incandescent Gas Light Company of England, nor is that Company interested in this Company. Your attention is called to the following correspondence, which defines **THE POSITION OF THE UNITED GAS IMPROVEMENT COMPANY**, whose name is mentioned in the advertisements which offer for subscription the stock of the Kern Incandescent Gas Light Company.

WELSBACH LIGHT COMPANY,
W. E. BARROWS, President.

WELSBACH LIGHT CO.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23d, 1899.

MR. THOMAS DOLAN, President the United Gas Improvement Company:

DEAR SIR: In yesterday's and to-day's New York and Philadelphia papers appear the advertisements of the International Banking and Trust Company soliciting subscriptions to the Capital Stock of the Kern Incandescent Gas Light Company. Among the names of the Directors of the said Trust Company published in the advertisements referred to appears the name of "George W. Elkins, United Gas Improvement Company, Philadelphia." As the United Gas Improvement Company has been prominently identified with the Welsbach Light ever since its introduction into the United States, the publication of its name in these advertisements, which also contain suggestions hostile to this Company, has greatly disquieted many of our shareholders. If you are willing to give me an authoritative statement of the position of the United Gas Improvement Company I shall be greatly obliged. Very truly yours,

W. E. BARROWS, President Welsbach Light Company.

THE UNITED GAS IMPROVEMENT COMPANY,
Broad and Arch Sts., Philadelphia, June 23d, 1899.

COL. W. E. BARROWS, President Welsbach Light Company:

Dear Sir: Answering your favor of even date, the United Gas Improvement Company is not now and never has been interested either in the Kern Incandescent Gas Light Company or in the International Banking and Trust Company. Mr. George W. Elkins is neither an Officer nor a Director of the United Gas Improvement Company, and does not represent the United Gas Improvement Company. Very truly yours,

THOMAS DOLAN, President,
United Gas Improvement Company.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Under Contract, 1899:

	SETS.	DAILY CAPACITY.
Fostoria, O.	1	250,000 Cubic Feet.
Derby, Conn.	1	750,000 "
Lowell, Mass.	1	1,000,000 "
Doylestown, Pa.	1	50,000 "
Darby, Pa.	1	400,000 "
Adrian, Mich.	1	125,000 "
Concord, N. H.	1	400,000 "
Sioux City, Iowa	1	750,000 "
Standard Gas Light Co., New York	3	5,400,000 "
Peekskill, N. Y.	1	250,000 "
Westchester, N. Y.	1	250,000 "
Jersey City, N. J.	1	1,000,000 "
Stapleton, N. Y.	1	750,000 "
London, O.	1	125,000 "
Chicago, Ills.	2	3,600,000 "
Putnam, Conn.	1	125,000 "
Mansfield, O.	1	250,000 "
Plymouth, Pa.	1	125,000 "
Athens, Pa.	1	125,000 "
Charlotte, N. C.	1	250,000 "
Total	23	15,975,000 "
Previously built	294	187,100,000 "
Grand Total	317	203,075,000 "

Established 1858. Incorporated 1890.
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Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

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This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

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Works, Weber, N. J.

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And Standard Fire Brick and Gas Retorts.

Works, LOCKPORT STATION, PA.

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In Kegs, 100 to 200 " " 6 " "
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AUTOMATIC GOVERNOR. OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT! WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION! REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE! IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

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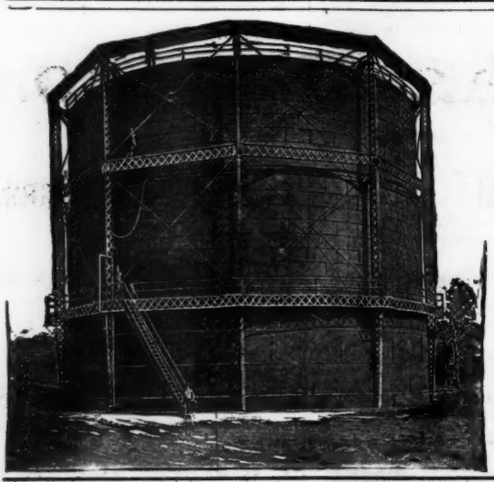

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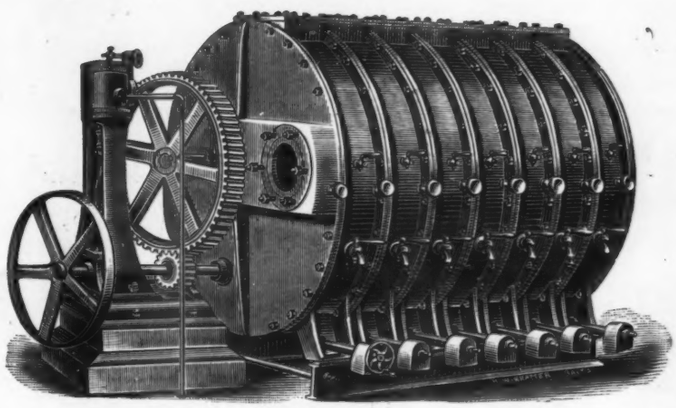

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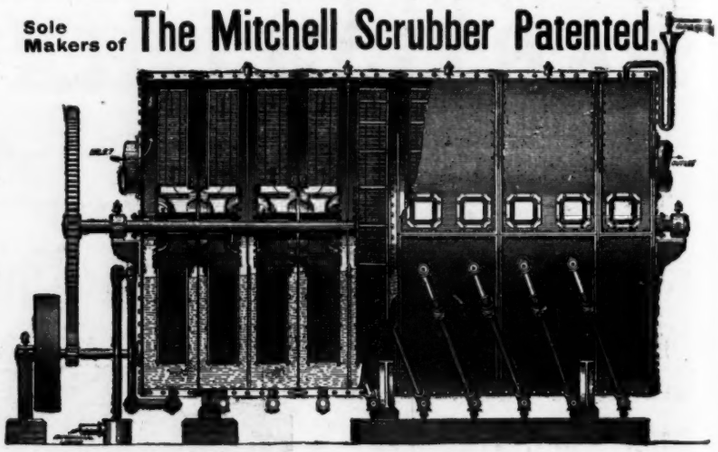

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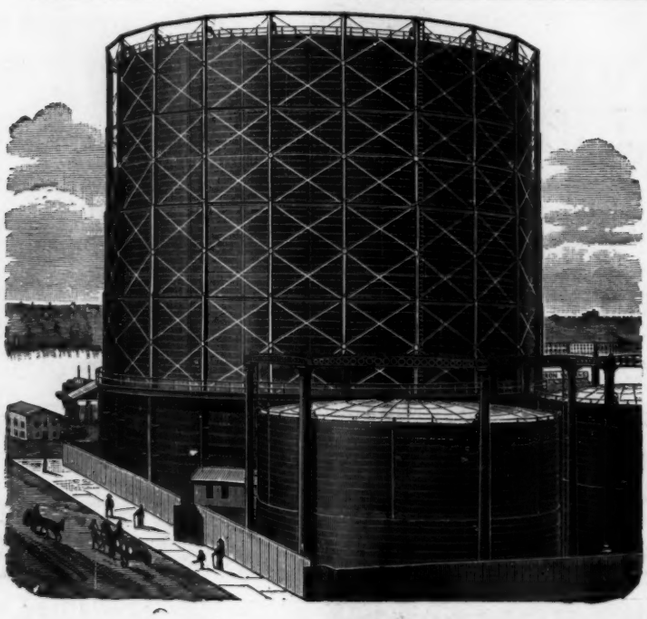

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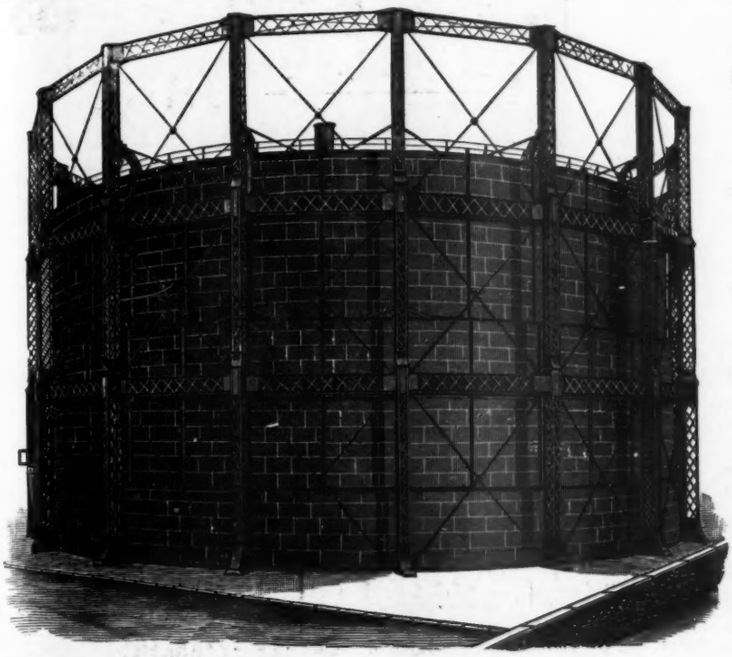

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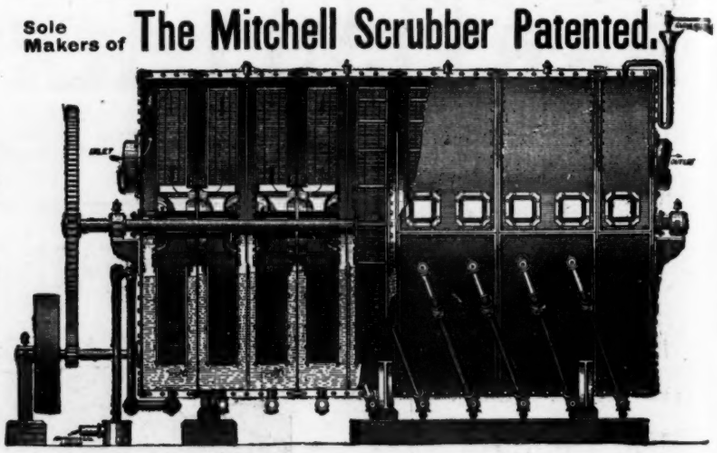

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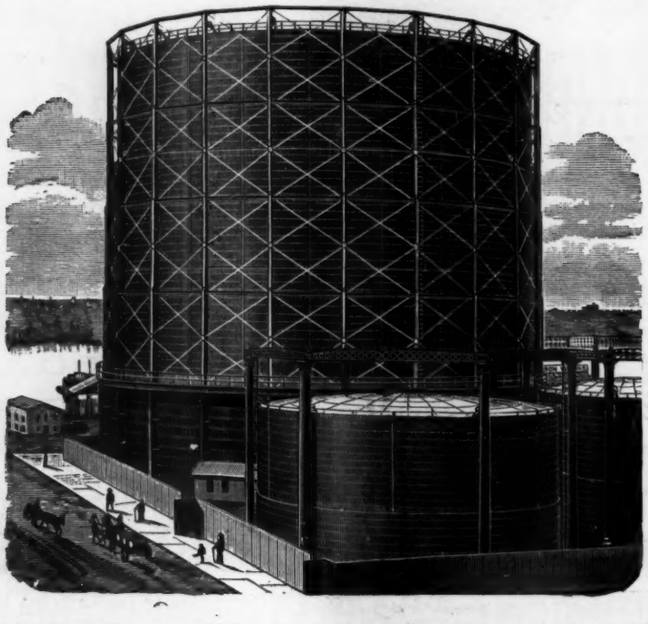

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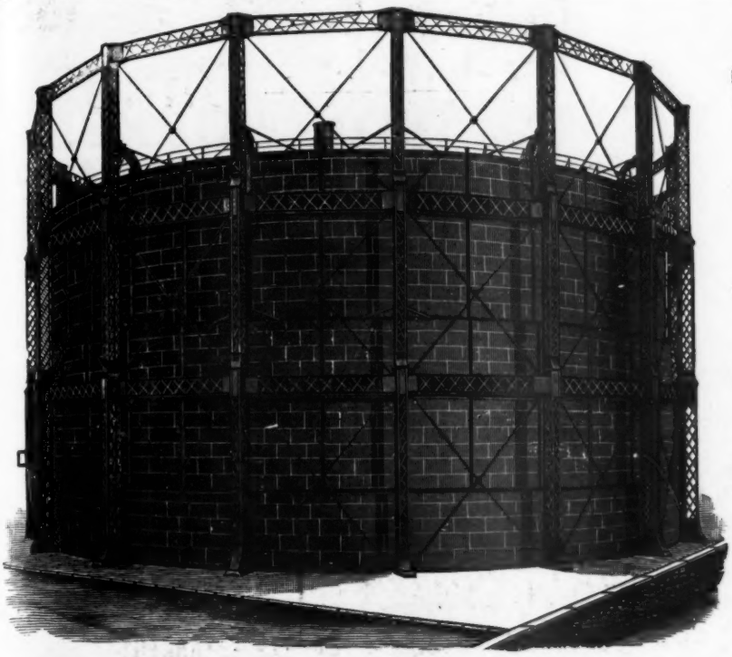

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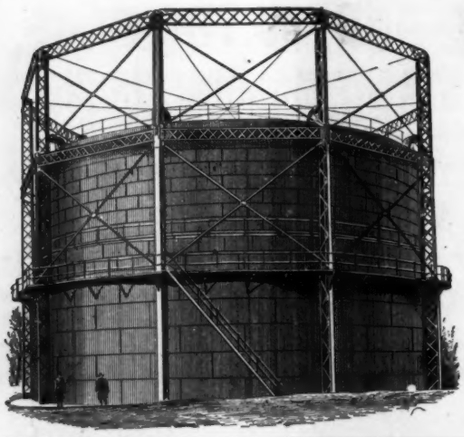

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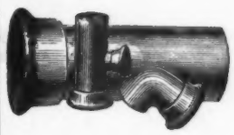

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All Parts Interchangeable

This Meter is an unqualified success in Great Britain. Its simplicity of construction, and the positive character of the service performed by it, have given it pre-eminence.

Needs Only the Care Given an Ordinary Meter.
Saves MONEY, TIME and CONSUMERS.
Dispenses with "DEPOSITS" and Increases OUTPUT.